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ABSTRACT

This teacher's guide complements six programs that aired on the Public Broadcasting System (PBS) in the fall of 2000. Programs include: (1) "Lincoln's Secret Weapon"; (2) "Hitler's Lost Sub"; (3) "Runaway Universe"; (4) "Garden of Eden"; (5) "Dying to Be Thin"; and (6) "Japan's Secret Garden". It provides activity set-ups related to the programs and what to do before and after watching the programs. Activity sheets, answers for the activity sheets, and additional resources are also included. (ASK)

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NOVA

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Garden of Eden

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The Park Foundation is committed to education and quality television. We are pleased to be able to advance the work of NOVA, the preeminent television series in science education. As you know, through study of science, young people acquire skills, knowledge, and — most of all — an intellectual curiosity.

The *NOVA Teacher's Guide* serves as an excellent supplement for your use. We are grateful to you for introducing students to the world of science.

PARK
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The future of a country lies in its young people, and the future of those young people lies in their teachers. As an educator, you know that shaping a future means working hard in the present.

I understand how much support you need in this effort, because helping shape futures is our business at Northwestern Mutual. The Financial Representatives of the Northwestern Mutual Financial Network provide expert guidance to help people put together personal financial strategies that will make a positive difference throughout their lives.

So it's with an eye toward the future that we offer you the new fall issue of the *NOVA Teacher's Guide*. I think this season's shows are full of interesting material for study, and the guide will turn them into a powerful teaching aid in your classroom. As proud sponsors of this award-winning educational series, everyone here at Northwestern Mutual would like to thank you for your integrity and dedication to shaping the future.

James D. Ericson
President and Chief Executive Officer

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Because of schedule changes, some NOVA programs do not have lessons.

* one-year off-air taping rights

(R) indicates a repeat program

Lesson within this guide

Lesson online at www.pbs.org/nova/teachers/teachersguide.html

Building Big*

www.pbs.org/buildingbig/

WGBH's science unit will broadcast a five-part miniseries on megastructures, premiering Tuesday nights in October 2000 (check local listings). Hosted by David Macaulay, acclaimed author and illustrator of **The Way Things Work**, each one-hour program focuses on a different type of large-scale engineering: bridges, tunnels, skyscrapers, domes, and dams. Discover the construction secrets and human stories behind famous structures, and see how civil engineers today are building bigger than ever before.

To receive a free copy of the *Building Big Activity Guide*, order from the Web site listed above or send your name, address, and the grades and subjects you teach to:

Building Big Activity Guide
WGBH
Educational Print and Outreach
125 Western Avenue
Boston, MA 02134

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NOVA in the Classroom

NOVA Examines Eating Disorders

Dear Educators,
This season we offer you an array of program topics, including underwater archaeology, naval technology, engineering, cosmology, ecology, and more. But we'd like to bring your attention to one program in particular, "Dying to Be Thin," which examines the causes and treatments for the eating disorders anorexia nervosa and bulimia nervosa.

According to Anorexia Nervosa and Related Eating Disorders Inc., more than half of teen-age girls are, or think they should be, on diets. They want to lose some or all of the 40 pounds that females naturally gain between the ages of 8 and 14. About 3 percent of these teens go too far, becoming anorexic or bulimic. Although males rarely suffer from the disorder, the rate among boys appears to be increasing.

Eating disorders can be a life-and-death issue. We hope our program and its accompanying lesson in this guide will help you address this sensitive, but critical, topic in your classroom. The program is scheduled to air the week of December 12. Check your local listings for more information. And visit our Web site just prior to the broadcast to find additional content on these disorders.

We wish you an engaging and rewarding fall semester. Thank you for bringing us into your classroom.

Paula S. Apsell
NOVA Executive Producer

NOVA Online's Teachers Site www.pbs.org/nova/teachers/

Teacher's Guide
Locate printable lessons to use with NOVA programs.

Sign Up for Weekly Updates
Would you like to know what's coming up on NOVA each week, both on television and the Web site? Join our mailing list and find out. Each week we'll send you a reminder of the date and title of the following week's broadcast, and what you'll find online to help you integrate the Web into your curriculum. And we'll keep you abreast of any special programs or online adventures we're planning.

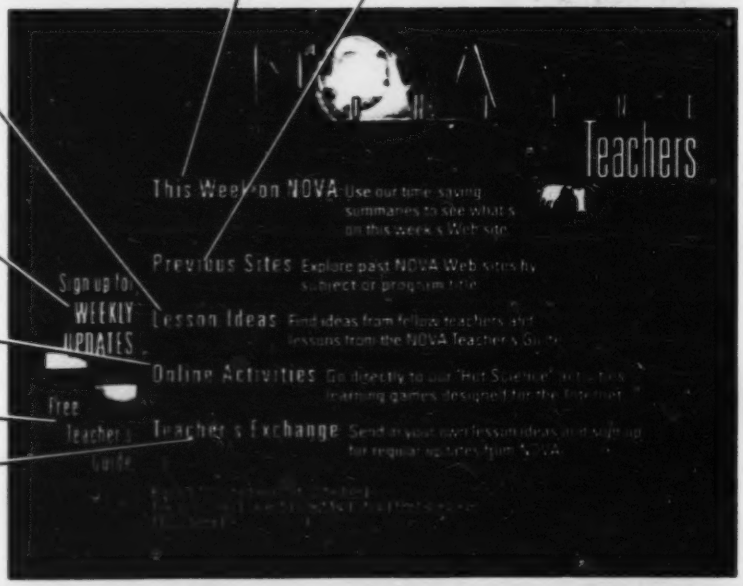
Online Activities
Find activities designed especially for the Internet.

Free Guide
Sign up to receive your free teacher's guide, by mail, twice a year.

Teacher's Exchange
Read lesson ideas from fellow teachers and send us your own ideas.

This Week on NOVA
This section features a listing of the science articles, multimedia presentations, and activities on the Web site that accompany the current NOVA program. Brief descriptions and grade-level designations are provided for everything on the site.

Previous Sites
Obtain access to Web content by program title or subject area for previous NOVA programs.



NOVA Featured Teacher

Teaching with Trebuchets

When it comes to building models, Bruce Kelly doesn't settle for the tabletop variety. He has his students think big when it comes to demonstrating projectile motion—like the life-size trebuchets they recently built.

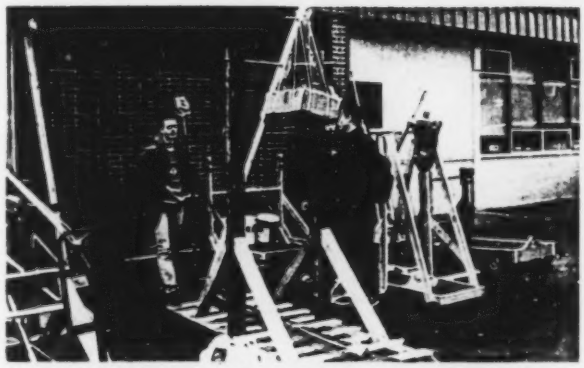
Kelly, a mathematics and science teacher at Sumner High School in Sumner, Washington, teaches a hands-on, project-based physics class. One such project—to build and test a life-size trebuchet, catapult, or ballista—culminates a unit on projectile motion. This year, NOVA's "Secrets of Lost Empires: Medieval Siege" program aired just before Kelly started his unit.

Students first received directions for the final project and submitted a detailed sketch and materials list for approval. During the six-day unit, students examined how projectiles moved in two dimensions and wrote parametric equations to describe the motion. Students investigated the relationship between the angle in which an object is launched and the distance traveled. Through this exercise, coupled with prior work on vectors, students learned that the horizontal component of the motion is not affected by the vertical component of the motion.

Although Kelly has taught the projectile motion unit for the past three years, this year students did something different—they viewed the "Medieval Siege" program. Kelly liked the way the program shows how engineers think through a problem and problem solve and tinker until the end result is achieved. Feedback was immediate—students voiced their enthusiasm right away.

Working individually or in teams of two, students constructed their final projects outside of class time. During the final two class days of the unit, students completed testing and fine-tuning their trebuchets and then pitted them against their peers.

During the competition, teams launched three water balloons 164 feet (50 meters) towards an appealing target—their teacher seated in a chair (with lots of protection, including a helmet and a very thick jacket). Two concentric circles, each 3.28 feet (1 meter) in radius, radiated outward from Kelly. Points were awarded for those whose balloons came closest to Kelly (whose luck is holding; he has not been hit by a balloon yet). Students then wrote equations for each of their three launches.



From left, Tyler Capes, Tom Adler, and Seth Garrison were several of Bruce Kelly's students who built and tested life-size trebuchets.

This year Kelly, who has been teaching for 15 years, was impressed by the number of student teams that chose to build the trebuchet and the overall quality of students' projects. When asked about the difference between this and past years' efforts, students credited the NOVA program with inspiring them and acting as a catalyst for motivating them to do further research. Kelly's take on it? "It is lots of fun and they get REAL excited when the balloons land close."

For more information about Kelly's project, you can contact him at:
Bruce Kelly
Sumner High School
1707 Main Street
Sumner, WA 98390
E-mail: bgkelly@psesd.org

Become a NOVA Featured Teacher

We'd like to hear from YOU! Tell us how you're using a NOVA program or NOVA Online in your classroom.

Send your comments to:
www.pbs.org/nova/teachers/teacherex.html
and we'll post them in our Lesson Ideas section.
Or send your ideas to:

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Boston, MA 02134
Gay_Mohrbacher@wgbh.org

If we choose to feature your classroom in our NOVA Teacher's Guide, we'll send you and your students six free NOVA videos or two Classroom Field Trip kits of your choice. (3)

Lincoln's Secret Weapon

Airs the week of October 24 • www.pbs.org/nova/monitor/

Program Contents

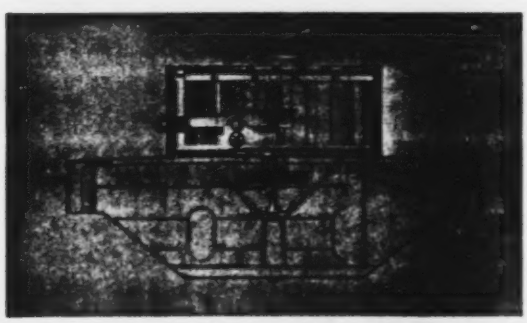
NOVA follows chief archaeologist John Broadwater, master diver Donny Denis, commander Chris Murray, and a 30-man Navy dive team as they mount an intensive effort to salvage and study the Civil War ironclad ship *Monitor*.

The program:

- reports how having the *Monitor* allowed the North to reinforce its blockade of the South.
- relates how the fight between the *Monitor*, the Union's first ironclad ship, and the Confederate ironclad *Merrimack* anticipated the end of wooden-ship warfare.
- recounts the biography of its inventor, John Ericsson, a mechanical engineer who designed the screw propeller, the rotating gun turret, the air-ventilation system, and many other innovations.
- tells the story of the battle of Hampton Roads where the two ironclad ships clashed, a battle some historians believe was more important than Gettysburg.
- shows how the dive team faced particular salvage difficulties and dangers posed by the location of the *Monitor* wreck in the Atlantic's Graveyard near Cape Hatteras.
- describes how maintaining strict procedures protects the divers from the physiological hazards of diving at depths more than 200 feet (61 meters).
- reenacts the battle between the *Monitor* and *Merrimack*.

Before Watching

1. Deep-sea diving is dangerous. Have students list some of the considerations associated with deep-sea diving. As they watch, have students take notes on the different dangers divers face.



Ericsson's gun turret was the first to use steam power and could revolve at a rate of 2.5 revolutions per minute, allowing the *Monitor* to fire in any direction without changing course.

After Watching

1. Discuss the dangers that divers face when diving to such extreme depths. What are the environmental challenges of deep-sea diving? What are the physiological challenges?

Activity Setup

Objective

To understand how principles of gas behavior relate to diving in order to plan safe underwater activities.

Materials for teacher

- 2 bottles of sugarless club soda, 12 ounce or liter, screw cap
- kitchen pan

Materials for each team

- copies of ***Dive, Dive, Dive*** activity sheet on page 6
- copies of ***Let's Go Diving*** activity sheet on page 7
- copies of ***Planning Your Profile*** activity sheet on page 8
- paper and pencil

Procedure

1. You can demonstrate the need for decompression stops with two warm bottles of club soda. First, shake the two warm bottles. Holding the first bottle over the kitchen pan, ***slowly*** unscrew the cap of one bottle until small fizz bubbles appear and some gas escapes. Tighten the cap and explain that this "diver" is now at a decompression stop and must wait until the extra gas has been released. Slowly unscrew and retighten the cap until all the gas has escaped.
2. Hold the second bottle over the kitchen pan. Explain that it represents a diver that came up with no stops. Unscrew the cap completely in one motion. All the gas that was in solution in the higher-pressure bottle comes out in one fast action.
3. Organize students into teams of two and distribute copies of the ***Dive, Dive, Dive***, the ***Let's Go Diving***, and the ***Planning Your Profile*** activity sheets to each team.
4. Explain to students that they are going on a diving vacation and must plan their dive schedules, or profiles, before they ever get in the water.
5. Tell students that they will be calculating for short, medium, and long dives. Explain that in a real situation, divers factor estimated and actual time at depth. Also explain the activity uses a fixed degassing rate to represent the idea that divers degas while on the surface. Actual degassing rates are more complicated.
6. Conclude with a discussion about how these principles of gas behavior were a consideration in the program. Talk with students about the differences between their dive activity *(where their dives were shallow enough—less than 100 feet (30.5 meters)—to use compressed air only)* and the dives done in the program *(which were so deep that they required divers to breathe a special gas mixture to help combat the narcotic effects of nitrogen at certain depths)*.

Standards Connection

The activity found on pages 6–8 aligns with the following *National Science Education Standards*.

Grades 5-8

Science Standards F:
Science in Personal and Social Perspectives

Personal health

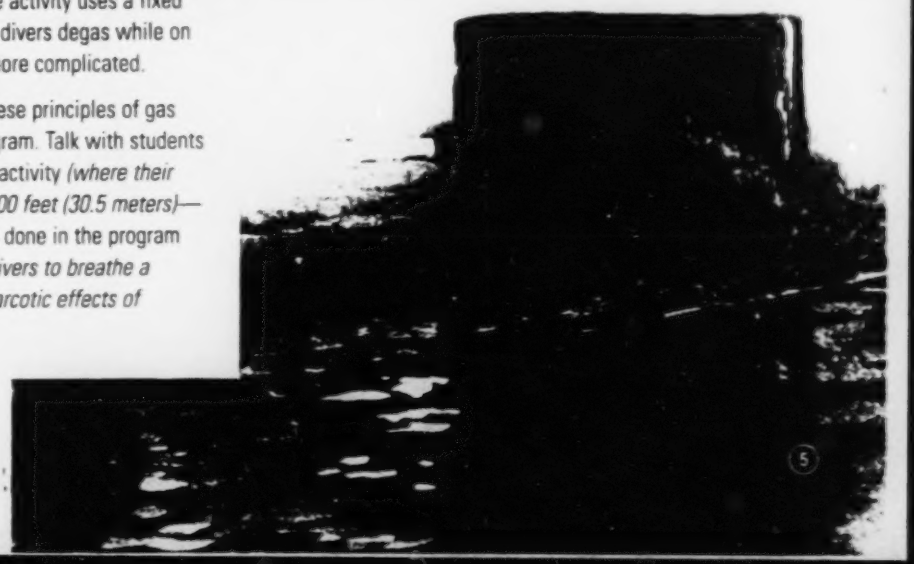
- The potential for accidents and the existence of hazards imposes the need for injury prevention. Safe living involves the development and use of safety precautions and the recognition of risk in personal decisions. Injury prevention has personal and social dimensions.

Grades 9-12

Science Standard F:
Science in Personal and Social Perspectives

Personal and community health

- Hazards and the potential for accidents exist. Regardless of the environment, the possibility of injury, illness, disability, or death may be present. Humans have a variety of mechanisms—sensory, motor, emotional, social, and technological—that can reduce and modify hazards.



Dive, Dive, Dive

NOVA Activity I **Lincoln's Secret Weapon**

You and three friends have just won a five-day diving trip to the Caribbean. In three days, how many dives and at what depth can your team safely do? Use the guidelines and diving table to select a profile that will allow the most diving time with the least risk.

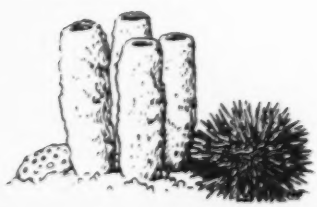
Procedure

1. Look at the Must Do List on your ***Let's Go Diving*** activity sheet. You and your friends have decided these things absolutely have to be done during your five-day stay on the island.
2. Now read your ***Planning Your Profile*** activity sheet.
   - The Diving Guidelines outline the things you should think about when planning your daily dive schedules, known as profiles.
   - The Dive Schedule tells you what has already been planned.
   - The Diving Table shows you how many gas points you accumulate for short, medium, and long dives at different depths. It also tells you how many gas points you lose while on the surface.
3. Your assignment is to design as many "safe" daily diving profiles as you can during your vacation. Look at what has already been planned on the Dive Schedule, combine that with everything you want to do on your Must Do List, and then plan how you will get everything done without accumulating unsafe levels of dissolved gas in your body.
4. Use the Diving Table to learn how many dissolved gas points are accumulated on each dive, subtract one gas point for each hour of rest, and then calculate your total gas points for that day.
5. Remember to use the Diving Guidelines while you are planning your dives.

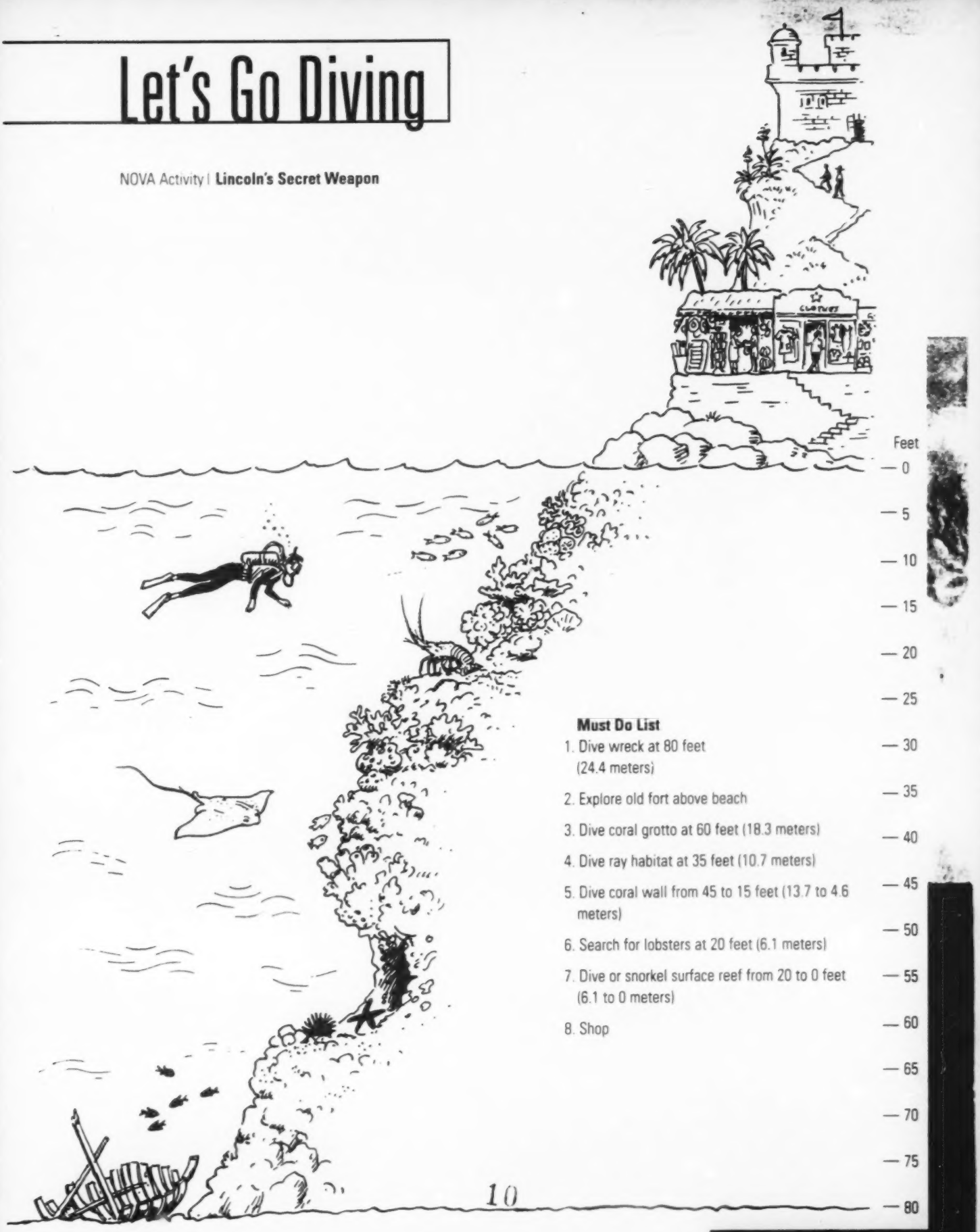
Questions

Write your answers on a separate sheet of paper.

1. With all activities, there is always the chance that something can go wrong. Planning without a safety margin can be risky. Look at your different profiles. Which one involved the least amount of dissolved gas? Which one involved the most? Which ones would you choose to do? Why?
2. Increasing pressure with depth and extending the dive time are the two main factors that determine the amount of gas that your body absorbs when diving. How are these factors evident in the dive tables?



Let's Go Diving



Must Do List

1. Dive wreck at 80 feet (24.4 meters)
2. Explore old fort above beach
3. Dive coral grotto at 60 feet (18.3 meters)
4. Dive ray habitat at 35 feet (10.7 meters)
5. Dive coral wall from 45 to 15 feet (13.7 to 4.6 meters)
6. Search for lobsters at 20 feet (6.1 meters)
7. Dive or snorkel surface reef from 20 to 0 feet (6.1 to 0 meters)
8. Shop

Planning Your Profile

NOVA Activity I **Lincoln's Secret Weapon**

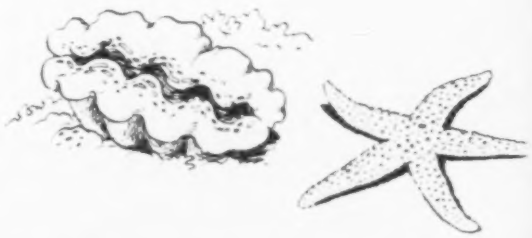
Diving Guidelines

1. When diving more than once a day, make the deepest dive first and the shallowest one last. This way, the largest amount of gas (gained from the deepest dive) is taken on early and can be lost over the longest period of time.
2. When using dive tables, the deepest point during that dive determines the depth of a dive.
3. When diving more than once a day, all dives of less than 40 feet (12.2 meters) are counted as 40-foot dives.
4. Divers should not dive within 24 hours of flight time because airplane cabins are only partially pressurized, and any remaining dive gas will be released as the plane leaves the ground.
5. So that you will not absorb an unsafe amount of dissolved gas, you cannot accumulate any more than 24 gas points per day.

Dive Schedule

Your team has made this schedule for the three days on the island. The first and fifth days are arrival and departure days.

- 9 a.m., first morning dive
- One-hour rest
- Second morning dive
- Three-hour rest
- Last dive, late afternoon



DIVING TABLE

Depth of dive	Dissolved gas points per dive		
	Short dive	Medium dive	Long dive
40 feet (12.2 meters)	1	3	12
50 feet (15.2 meters)	2	4	18
60 feet (18.3 meters)	3	6	22
70 feet (21.3 meters)	4	9	26
80 feet (24.4 meters)	5	12	30
Time at surface	After returning to the surface, divers continue to lose dissolved gas. Subtract 1 gas point for each hour of rest between dives.		

Activity Answer

The amount of atmospheric gases that dissolve in human blood and tissue depends on the surrounding pressure. As divers descend, the increasing pressure causes ever-greater amounts of nitrogen gas to dissolve in their blood. As they return to the surface, this extra dissolved gas will leave the body through the lungs where it is removed from the blood and released; but only if they ascend slowly—if they don't, large nitrogen bubbles could form causing decompression sickness (also known as the bends). Divers control the release of gases from their blood by ascending in stages called decompression stops. These stops reduce the pressure slowly, allowing gas to escape so that large bubbles do not form.

Students will discover that there are several safe dive profiles each day. Here's an example:

Dive Profile

First dive, wreck, medium time, 80 feet	+12 points
Rest for one hour	- 1 point
Second dive, Ray habitat, medium time, 35 feet (40 feet)	+ 3 point
Rest for three hours	-3 points
Last dive, search for lobsters, long time, 20 feet (40 feet)	+ 12 points
Total dissolved gas points	***23 points***

The lower the day's dive points, the safer the dive profile. Note that the third day should be reserved for exploring and shopping because no diving is allowed within 24 hours of flight. (See guideline No. 4.)

Scanning the rows and columns of the dive table shows that the longest dives earn more points. Similarly, the deepest dives also earn more points.

In the program, once the divers began to cut the propeller shaft, it became clear that the operation would take more time than originally thought. The question then became which would come first: The cut would be completed, or all divers would reach their maximum dissolved gas levels and have to leave the job unfinished. An even more important factor for them to consider was the environmental conditions they faced, such as strength of underwater currents and surface weather conditions.

Important Note

Diving can be a dangerous sport, which is why it's one of the few recreational activities that certifies participants. The Diving Table on page 8 is loosely based on dive tables used by the U.S. Navy without decompression stops and is included here for the purpose of introducing the basic concept of diving physiology. Its utility is limited to this purpose only. Potential divers must receive proper instruction by enrolling in a diver training program offered by recognized certification agencies.

Resources

Books

Davis, William C.
Duel Between the First Ironclads.
Mechanicsburg, Pennsylvania: Stackpole Books, 1994.
Presents the history of the building of the Monitor, *combining the very latest in naval invention and technology.*

De Kay, James T.
***Monitor:* The Story of the Legendary Civil War Ironclad and the Man Whose Invention Changed the Course of History.**
New York: Walker, 1997.
Focuses on how ironclad ships came into being, including John Ericsson's work of over 20 years to have his vision of a warship become reality.

Mindell, David A.
War, Technology, and Experience Aboard the *USS Monitor.*
Baltimore, Maryland: Johns Hopkins University Press, 2000.
A carefully documented history that reads like an adventure story. It examines the experience of the Monitor's *crew and its reactions to the thrills and dangers that came with this new war technology.*

Article

Grim, Pamela
"Trouble on Flight 1368."
Discover, September 2000, 46.
Details the case of a woman who experienced decompression sickness during a flight she took following a diving vacation in Bimini.

Web Sites

NOVA Online—Lincoln's Secret Weapon
www.pbs.org/nova/monitor/
Follows the story of the futuristic armored combat vessel, Monitor, *which opened up a new chapter in naval warfare. Reveals more about the Navy's risky efforts to salvage the secrets of the* Monitor, *and includes articles, activities, resource links, and more. Launch date: Friday, October 20.*

Diving Medicine Online
www.gulftel.com/~scubadoc/
Contains myriad information about the physiological effects of diving.

Hitler's Lost Sub

Airs the week of November 14 • www.pbs.org/nova/lostsub/

Program Contents

NOVA follows an American dive team trying to identify the wreck of a German U-boat 60 miles off the coast of New Jersey.

The program:

- follows researchers as they spend more than six years diving to the 230-foot- (70-meter) deep wreck searching for clues to its identification.
- depicts the challenges of deep-sea diving.
- documents changes in submarine design from the 1800s to after WWII using diagrams, actual movie footage, and interviews with surviving German submariners.
- provides accounts of what life was like on a submarine.
- outlines the use of submarines and their attack and defense strategies in WWI and WWII.
- depicts *Drumbeat*, a German submarine operation that executed attacks on American shipping along the Atlantic Coast during the winter of 1941–1942.
- relates the Allies' development of technology, such as improved radar and sonar, that played an important part in neutralizing the success of German submarine warfare toward WWII's end.

Before Watching

1. To get students thinking about buoyancy, ask them this: Boats are made out of iron and steel, which are denser than water. Why don't they sink? To investigate buoyancy with students, bring in tub toys and have students push them under the water. Which ones sink and which ones float? Why? As they watch, have students record how German engineers designed U-boats to both maneuver and maintain position underwater.

2. To demonstrate buoyant force, use a cork or inflated balloon and have students push it down into a tub of water. As students push down, they are feeling the buoyant force exerted on the object by the water.

Two hundred and fifty feet long, 22 feet wide, and weighing 1,100 tons, the U-boat's sole purpose was to hunt and destroy.

After Watching

1. Submarine captains know that cold seawater is denser than warm seawater so the cold seawater sinks. Have students discuss the adjustments a submarine captain would order on a submarine during an underwater voyage from Florida, northward to under the polar ice cap, and then south to Hawaii.

Activity Setup

Objective

To investigate weight and buoyant force as applied to submarines.

Materials for each group

- copies of the ***Build Your Own Submarine*** activity sheet on page 12
- 2-liter plastic soda bottle, rinsed, label removed, and cut to specifications
- package of 3-ounce drinking cups, plastic preferred
- large needle
- large paper clips
- kitchen utility scissors
- waterproof markers
- water, room temperature
- dishwashing liquid
- for ballast: paper clips and metal washers

Procedure

1. Before class, prepare diving tanks for each group by cutting around the shoulder of a soda bottle so that the remaining base is tall and straight-sided. For safety, use kitchen utility scissors. This activity involves working with these "tanks" filled with water. Work in a wet lab, outdoors, or place them in plastic dishpans.

2. Organize students into groups and distribute copies of the ***Build Your Own Submarine*** activity sheet. Demonstrate for students the construction of a submarine:
   a. Poke two holes with a large needle on opposite sides of the drinking cup's rim.
   b. Bend a large paper clip into a U-shape and attach to the cup through the holes.
   c. Neatly cut a bean-shape hole in the side of the cup about a quarter of an inch (6.35 mm) from the bottom. The submarine will be easier to control if the edge of the hole nearest the cup bottom is straight and parallel to the cup bottom.

3. Supervise students as they build their submarines and prepare their diving tanks. (If students have difficulty making their submarines neutrally buoyant, add some dishwashing liquid to the diving tank. This will reduce the surface tension, making the size of the escaping bubbles smaller and thus making it easier to achieve neutral buoyancy.)

4. Once students have gotten their submarines to be neutrally buoyant, conduct a class discussion about buoyancy using the scenarios listed in the questions section of the activity sheet.

5. As an ***extension,*** change the density of the water and repeat the experiment. First have students predict what might happen, then take out the submarine, dissolve sugar or salt into the water, and put the submarine back in again.

Standards Connection

The activity found on page 12 aligns with the following *National Science Education Standards.*

Grades 5-8

Science Standard B:
Physical Science

Motions and forces

- The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and represented on a graph.
- An object that is not being subjected to a force will continue to move at a constant speed and in a straight line.

Grades 9-12

Science Standard B:
Physical Science

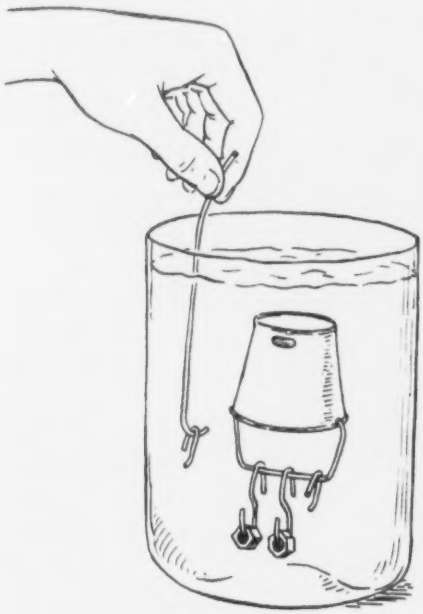
Motions and forces

- Objects change their motion only when a net force is applied. Laws of motion are used to calculate precisely the effects of forces on the motion of objects. The magnitude of the change in motion can be calculated using the relationship $F = ma$, which is independent of the nature of the force. Whenever one object exerts force on another, a force equal in magnitude and opposite in direction is exerted on the first object.
- Gravitation is a universal force that each mass exerts on any other mass.

Build Your Own Submarine

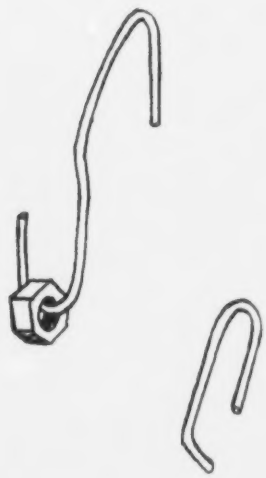
NOVA Activity | **Hitler's Lost Sub**

A submarine is not just a silent shape gliding smoothly along under the sea. The submarine's crew is constantly making adjustments to keep it from bobbing to the surface or sinking below its safe depth. Here's an activity that let's you be the submarine captain.



Procedure

1. Your teacher will demonstrate how to make your submarine. Use markers to name your submarine.
2. Fill your soda bottle "diving tank" to within a half-inch (12.7 mm) of the top and stir in a few drops of dish-washing liquid. Place your submarine bottom-side up in the tank where it will float like an actual submarine floats on the surface.
3. Sink the submarine by pushing lightly with your finger. What happens when you release it?
4. Carefully add ballast by hanging pieces of paper-clip wire and metal washers to the paper clip hanging from your submarine until it starts to dive. What happens to the submarine as you add more ballast?
5. Now for the challenging part. Can you make your submarine behave like a real submarine? Can you get the ballast just right so that it is neutrally buoyant, that is, its weight is equal to the water's buoyant force? You'll know you have succeeded if your submarine goes neither up nor down—it stays at the depth it is at.



Questions

Write your answers on a separate sheet of paper.

1. Imagine that you're a U-boat captain. You've sighted your target and are about to launch two 2,000-pound (0.9-metric ton) torpedoes from your forward torpedo room. Destroyers heavily patrol the surface. Whoosh! Your bow just got 4,000 pounds (1.8 metric tons) lighter. Think about what you learned about buoyancy. What is going to happen to the submarine? What will you do in response?
2. The Straits of Gibraltar, an entrance to the Mediterranean Sea, is a narrow stretch of water. The water lies in two layers—a lower, saltier layer that is more dense than the surface layer above. The surface layer moves into the Mediterranean and the lower layer moves into the Straits. If you were a U-boat commander, how might you take advantage of this knowledge so that you could enter and leave the Mediterranean silently?

Activity Answer

A submarine rises because the weight of water pushing up on the submarine, known as the buoyant force, is greater than the downward force, the weight of the submarine. If the submarine weighs *more* than the buoyant force, it sinks. If it weighs *less* than the buoyant force, it will rise. If the buoyant force and the weight are *equal* it will drift (either on or beneath the surface). At this point, the submarine is neutrally buoyant. That is, there is no tendency for it to rise or sink so the submarine should remain at whatever level it was placed.

Divers use this same principle when they add or let air out of their buoyancy vests in order to control their position in the water. Bony fishes use a swim bladder to maintain neutral buoyancy. Like the diver's buoyancy vest, this saves energy that would otherwise be spent maintaining vertical position.

A submarine fills its tanks with water to submerge and pumps the water out to rise. After a torpedo launch, water must enter the diving hull to compensate for the loss of weight. Otherwise, the sudden unequal forces will drive the submarine to the surface.

During WWII, German submarines routinely escaped detection by switching off their engines and taking advantage of the currents flowing in and out of the Mediterranean Sea. The submarine captains would adjust the amount of water in the diving hull so that they would float within the current of either the surface or lower layer.

Resources

Books

Lafferty, Peter.
Eyewitness Science: Force and Motion.
New York: Dorling Kindersely, 1992.
Discusses the principles behind several different kinds of force and motion, including buoyancy.

Mulligan, Timothy P.
Neither Sharks Nor Wolves: The Men of Nazi Germany's U-Boat Arm, 1939-1945.
Annapolis, Maryland: United States Naval Institute Press, 1999.
A character study of the men in Germany's submarine force, based on first-person interviews and a survey of more than 1,000 U-boat officers and enlisted men.

Tall, J. J.
Submarines (History Series).
New York: Barrons, 1998.
The earliest experiments with submarines date from the 16th century, but the first practical submarines were built from the designs of Irish-American engineer J.P. Holland at the beginning of the 20th century. Diagrammatic illustrations, battle illustrations, and photos show submarine development, with emphasis on the vessels of WWI and WWII, and modern nuclear submarines.

Web Site

NOVA Online—Hitler's Lost Sub
www.pbs.org/nova/lostsub/
Chronicles the story of a German U-boat wreck discovery off the coast of New Jersey in 230 feet of water. Charts the years of archival research and the dangerous dives onto the wreck to finally identify the sub. Explores the U-boat phenomenon as it played out through two world wars in articles, activities, resource links, and more. Launch date: Friday, November 10.

Runaway Universe

Airs the week of November 21 • www.pbs.org/nova/universe/

Program Contents

NOVA follows cosmologists trying to understand why the universe may be expanding at an accelerating rate.

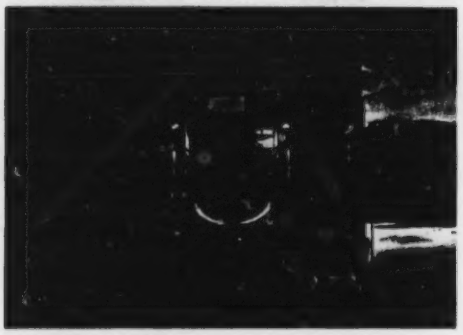
The program:

- reviews data from two teams of astronomers that seem to indicate some unknown force that is causing the universe to expand faster and faster.
- explains that the astronomers are basing their theories on observations of type 1A supernovae, which are believed to be uniformly bright and thus can be used as reference points or "mileage markers" to measure the expansion of the universe.
- reviews the technical and logistical challenges involved in finding the right kind of supernova for further study.
- shows how astronomers painstakingly compare recent and months-old images of thousands of galaxies looking for minute changes in brightness that signal a supernova.
- notes that preliminary data indicate that the universe is accelerating in its expansion, not slowing down due to gravity as previously believed.

Before Watching

1. Ask students what kind of objects they see when they look up into the sky. Review the visible objects students might see—such as stars and planets—as well as the ones they probably don't—including galaxies and supernovae. Discuss what a light year is and tell students that the farther away that astronomers detect radiation, the closer they are to seeing what the beginning of the universe was like.

2. Have students record how scientists in the program react to the news of discoveries. Do scientists dismiss them or find discoveries exciting?



Cosmologists will use telescopes like the new MMT on Mt. Hopkins in Arizona to investigate questions about the origin and evolution of the universe.

After Watching

1. Discuss the benefits or drawbacks to having different approaches to measuring the universe. What are the advantages or disadvantages to the competition among scientists to be first in a discovery?

2. Review students' observations about how scientists in the program approached and interpreted their data and the data collected by other scientists. Why might scientists react differently? How do scientists deal with different interpretations of the same data?

Activity Setup

Objective

To model how scientists use indirect observations to define problems that are not directly measurable.

Materials for teacher

- carpenter's wood glue or other liquid adhesive
- hole puncher
- masking tape

Materials for each group

- copies of the *What's in the Box*? activity sheet on page 16
- empty cereal box
- shish kebab skewer
- suggested items to be included in each box: marble, fork or spoon, tablespoon of breakfast flakes, table tennis ball, blob of modeling clay
- balance and ruler
- unlined paper

Procedure

1. Have students bring in empty cereal boxes before activity date.
2. Remove any wax paper lining from the cereal box and add the items to be detected. The items listed above were chosen based on their distinctive sound, weight, texture, or pattern of movement. Any object that has a distinctive characteristic may be included or substituted. All boxes should contain the same type and number of objects.
3. Punch a quarter-inch (6.4 mm) hole in the center of the top flap close to the fold. A hand-held hole puncher is ideal for this. When finished, this hole will be off-center in the middle of the top.
4. Put a dab of glue on the open flaps of the box and close. Temporarily secure the flap with masking tape.
5. When the glue has dried, remove the masking tape and put a small piece of masking tape over the quarter-inch hole.
6. Organize students into groups and distribute boxes to student groups along with a copy of the *What's in the Box*? activity sheet.
7. Have students record as much information about the boxes as they can. After teams have made initial conclusions, distribute one skewer per team. Have teams remove the tape from the quarter-inch hole so that they can explore with their probe.
8. Have each group summarize its findings and choose one person to present the group's conclusions to the class. To conclude the lesson, discuss the similarities and differences in students' findings and have students assess each others' methods for exploring the boxes. Do students think it is important to have everyone agree on what is in the box? How might any differences in opinion be resolved?

Standards Connection

The activity found on page 16 aligns with the following *National Science Education Standards*.

Grades 5-8

Science Standard A:
Science as Inquiry

Understandings about scientific inquiry

- Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. The scientific community accepts and uses such explanations until displaced by better scientific ones. When such displacement occurs, science advances.

Grades 9-12

Science Standard A:
Science as Inquiry

Understandings about scientific inquiry

- Scientific explanations must adhere to criteria such as: a proposed explanation must be logically consistent; it must abide by the rules of evidence; it must be open to questions and possible modification; and it must be based on historical and current scientific knowledge.

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What's in the Box?

NOVA Activity I **Runaway Universe**

What's in the Box?

How can scientists explain what they have not actually seen? For example, if no light escapes from a black hole, how can astronomers locate it? How can scientists characterize things they can't see with the naked eye, like faraway galaxies? You will use indirect observations to determine the contents of a cereal box universe that cannot be seen.

Procedure

1. Your teacher will provide you with a cereal box universe. Your task is to determine what is in the box.
2. Your team can do any test on the cereal box universe as long as it doesn't damage it. Do not remove the masking tape from the top of the box.
3. Make two columns on a sheet of paper. Record each item that you theorize to be in the box in the left column and the indirect observation that allowed you to detect it in the right column.
4. After you've had a chance to test your universe, your teacher will give you a new research tool, a probe (the skewer). Remove the masking tape from the top to expose a small hole.
5. Using your probe, can you add new items to your list or confirm old ones?

Questions

Write your answers on a separate sheet of paper.

1. What tests done by your team were most helpful in determining the contents of your universe?
2. How did your view of what was in the box change as you collected additional data?
3. How does the evidence you collected support your theory about what is in the box?
4. What, if any, other theories might explain the data you collected?
5. What other tests might you perform to find out more information about what is in the box?

Activity Answer

Students will probably find that the sound of the items was the first thing they observed. They may shake the box to try to ascertain the weight of the items within by how the items feel when they move in the box. Students might try to discover the shape of the objects by shaking the box to determine how the objects sound when they move around. Students might try to smell the box to see what information they can gain through that sense. The probe can reveal more about the nature of the materials within the box.

Students might choose to calculate the box's average density by weighing and measuring the box and then dividing the box's mass by its volume. They might also think of additional probes that could be used to better differentiate the material in the box.

Any difference in opinion among students might be resolved with better instrumentation to test the box, additional data collected from other groups, or a new theory that could explain what is in the box.

Resources

Book

Goldsmith, Donald.
The Runaway Universe: The Race to Discover the Future of the Cosmos.
Cambridge, Massachusetts: Perseus Books, 2000.
Explores the latest news on the cosmological constant: that the rate the universe is expanding is actually increasing. Reveals how tentative these latest findings are and describes the consequences of these findings, if true.

Article

Stephens, Sally.
"Hubble Warrior."
Astronomy, March 2000.
Profiles cosmologist Wendy Freedman, who finds herself at the center of the raging debate about how old and big the cosmos is, and how fast it is expanding.

Web Sites

NOVA Online—Runaway Universe
www.pbs.org/nova/universe/
Delves deeper into the program's content and themes, with features such as articles, timelines, interviews, activities, resource links, and more. Launch date: Friday, November 17.

Sloan Digital Sky Survey
www.sdss.org/
This survey will eventually map in detail one-quarter of the entire sky, determining the position and absolute brightness of more than 100 million celestial objects. It will also measure the distances to more than a million galaxies and quasars.

Structure and Evolution of the Universe
universe.gsfc.nasa.gov/
NASA site detailing its missions to study the extremes of gravity, space, and time. Offers what's known about such questions as: How did structure in the universe form?

Supernova
legacy.gsfc.nasa.gov/docs/snr.html
NASA site explaining what a supernova is and offering images of supernovae explosions in the Milky Way galaxy, as well as online animations of phenomena like black holes.

Garden of Eden

Airs the week of November 28 • www.pbs.org/nova/eden/

Program Contents

NOVA travels to and explores the diversity of the Seychelles islands off the coast of Africa and considers how the wildlife there evolved.

The program:

- shows how the Seychelles' central granitic islands were once part of the heart of Gondwanaland before breaking away from present-day India as it slid past Madagascar about 160 million years ago.
- looks at some of the hundreds of plant species and thousands of insects that populate the islands, including pitcher plants and leaf insects.
- tells how 200 years of settlement on the main island has destroyed much of its wildlife.
- reviews the wildlife on smaller granitic islands nearby, including noddy terns, skinks, and tortoises.
- speculates how some of the organisms might have come to live at each of the islands.
- shows how part of the Seychelles islands has formed into the world's largest atoll—a string of four coral islands featuring an enclosed lagoon.
- provides numerous examples of the cooperative and competitive interplay between and among various Seychelles' plants and animals.

Before Watching

1. Have students locate the Seychelles on a world map or a globe and make some predictions about its climate based on its latitude.

2. Review with students the following concepts: habitat, niche, and competition. (See *Activity Answer* on page 19 for more information.) Discuss how both structural and behavioral adaptations help an animal survive. Have students identify the niches in their school or town and how organisms fit into each niche.

3. As students watch, have them chart the following characteristics about the animals and plants shown in the program—name of organism, niche, diet, predators, helpful organisms, and other information. Have half of the class fill in the chart for plants and the other half fill in the chart for animals.

This "sea coconut," or coco-de-mer, is the world's largest seed. The palm tree from which it comes is isolated in the Seychelles as the seed will not germinate after being doused in seawater.

After Watching

1. Discuss the different organisms students saw and the places where the organisms live. Create a class chart of all the information that was collected.

2. Discuss examples in nature where an indigenous species has been displaced by a nonindigenous species, such as the kudzu plant in the South or the zebra mussel in the Great Lakes.

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Activity Setup

Objective

To collect and analyze information in order to invent an organism with adaptations to fit a particular niche, and predict its impact on the other populations.

Materials for each group

- copies of the *I Can Live Here* activity sheet on page 20
- drawing paper
- lined paper to make charts
- art supplies, such as colored pencils, and rulers
- reference books, magazines, and Internet access for research

Procedure

1. Organize students into groups and distribute a copy of the *I Can Live Here* activity sheet to each student.
2. Discuss animal and plant adaptations to their environments. Have students first review the different organisms that were in the program and then do additional research to find out more about the kinds of organisms that live in the Seychelles.
3. Once students have completed their research, have them consider the kind of organism they would like to introduce into the environment. Have them consider what niche they want to introduce their organism into, what occupies each niche already, and what their organism would need to survive in that niche.
4. Have students develop answers to questions about their organisms based on characteristics of living things. Make sure students consider both structure and function when creating their plant or animal.
5. Have students draw the organism and describe how each of its parts and behaviors help it to survive in the new habitat.
6. Finally, have students predict the impact of this new resident on the other island communities.

Standards Connection

The activity found on page 20 aligns with the following *National Science Education Standards*.

Grades 5-8

Science Standard C:
Life Science

Structure and function in living systems

- Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems.

Populations and ecosystems

- A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.
- The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

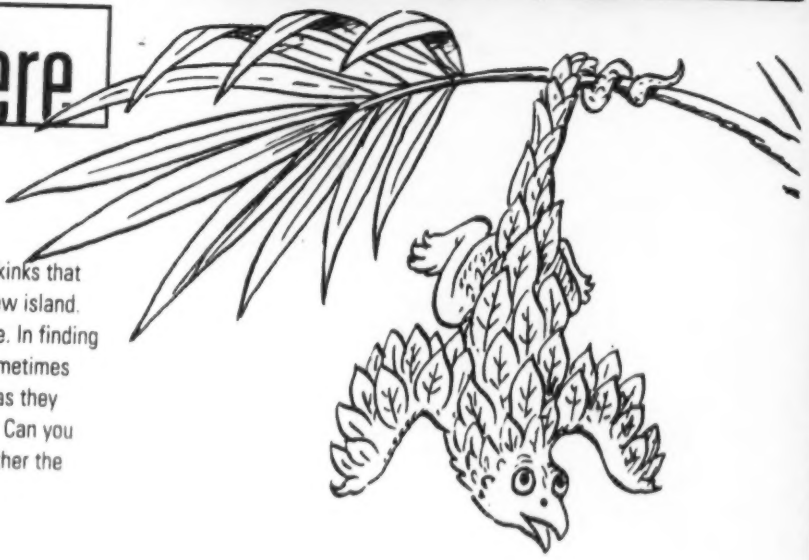
Grades 9-12

Science Standard C:
Life Science

The interdependence of organisms

- Organisms both cooperate and compete in ecosystems. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.
- Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite. This fundamental tension has profound effects on the interactions between organisms.

I Can Live Here



NOVA Activity I **Garden of Eden**

The program shows a raft of geckos and skinks that find themselves carried by currents to a new island. Here they must find a niche or they will die. In finding a niche, organism "invaders" like these sometimes displace organisms that are already there as they compete for the same food or living space. Can you invent an organism that could survive in either the granitic or coral islands of the Seychelles?

Procedure

① Describe the different plants and animals of the granitic and coral Seychelles islands.

② Based on your knowledge of what lives on the Seychelles islands, invent a plant or animal with adaptations that make it able to survive in the ecosystem of one of the island types. You may want to consider the following questions when creating your organism:

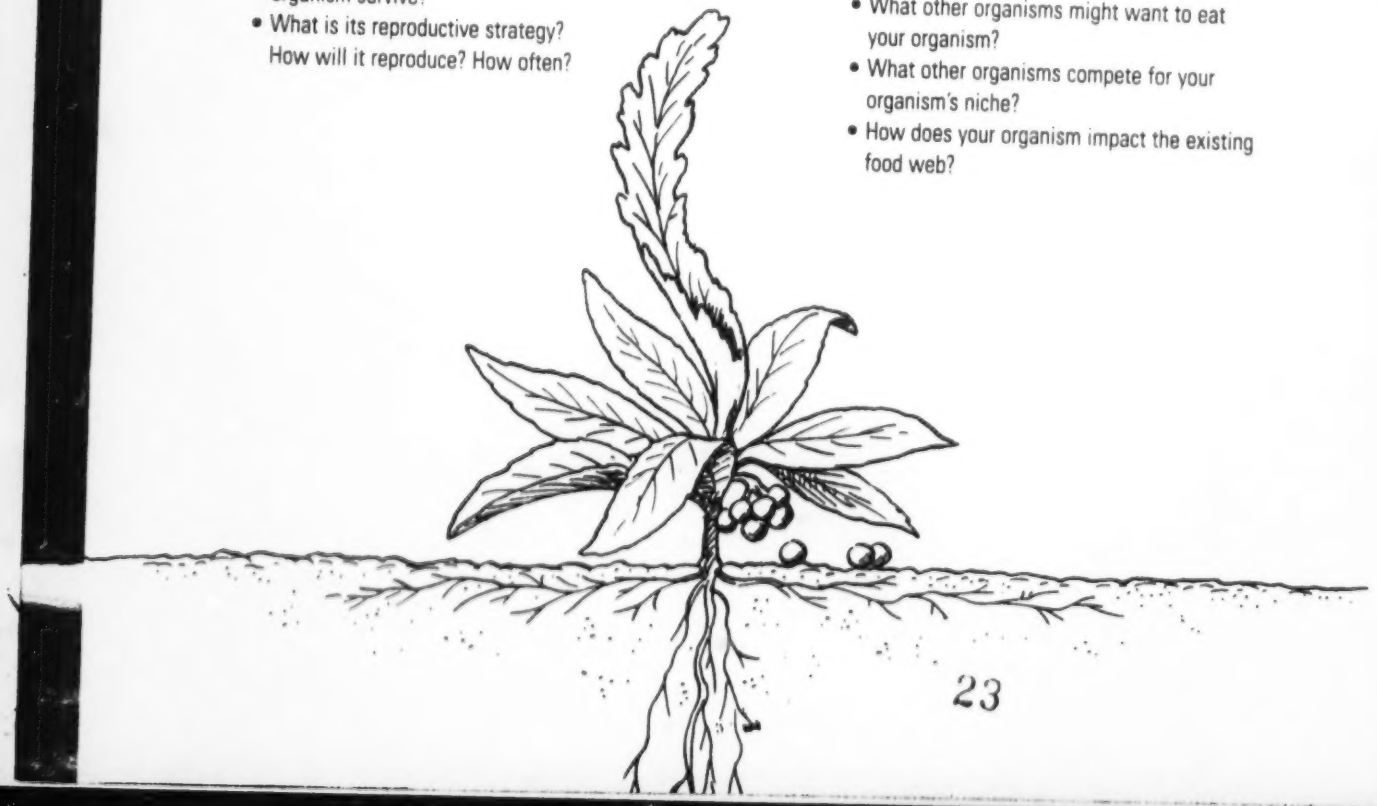
- How big is your organism going to be?
- What kind of food will it eat? How much food will it need to survive? How will it capture its food?
- What behaviors will your organism possess that will aid its survival?
- What other organisms might help your organism survive?
- What is its reproductive strategy? How will it reproduce? How often?

③ Be sure to describe the form and function of each trait your organism possesses.

④ Draw the organism, explaining special adaptations that might enable it to find a niche where it could survive. For example, an animal might have skin or feathers to which the sticky seeds of the mapou tree do not stick, thereby allowing it to fly away after feeding.

⑤ Analyze the impact of this new species on the island's food web. Consider these questions as you conduct your analysis:

- What other organisms might want to eat your organism?
- What other organisms compete for your organism's niche?
- How does your organism impact the existing food web?



Activity Answer

A habitat is a place where an organism lives. A habitat contains the basic necessities and correct combination of light, food, air, water, and temperature in a sufficient space. A mature forest is an example of a habitat. A niche is the role and position of an organism within its habitat. An organism's niche is determined by how it uses available resources to survive and how it interacts with other species. Because each organism in an established community has a distinctly different niche, any newly introduced organism cannot exist in a niche that is already occupied. The organisms will engage in competition, leaving only one to occupy the niche.

Information from the program and students' research will give students background information about the unique plants, animals, and habitats found on the granitic and coral islands of the Seychelles, as well as the particular niche occupied by each. With this information, students should be able to choose a niche for their invented organism. Familiarity with the different habitats will help them design their organism with features necessary to live in the chosen niche. Considerations to include in an animal design might include size, length of legs, ability to fly or swim, diet, body covering, and much more. A plant design might include the amount of sunlight the plant needs to live, size, time and method of pollination, and any physical traits used for defense or cooperation with other organisms. Students should describe features in terms of both form and function.

In analyzing the impact of the organism on the island's food web, students should again refer to the information they collected about the plants and animals that currently populate the different island types of the Seychelles. Special consideration should be given to both the place where the new organism will live and its diet. Together they may impact the lives of the other island residents. This analysis should include reasons for any conclusion that students reach.

Resources

Books

Henkel, Friedrich-Wilhelm, and Wolfgang Schmidt.
Amphibians and Reptiles of Madagasar, the Mascarenes, the Seychelles, and the Comoros Islands. Crocodiles and Alligators.
Melbourne, Florida: Krieger Publishing Co., 2000.
Presents descriptions and photographs of the island fauna. An encyclopedic and illustrated reference book with in-depth articles by leading crocodile researchers.

Settel, Joanne.
Exploding Ants: Amazing Facts About How Animals Adapt.
New York: Atheneum/Simon and Schuster, 1999.
Explores examples of wonderful adaptations that make it possible for a great variety of creatures to live and thrive on Earth as they find shelter, food, and safety in nature.

Waterlow, Julia.
Islands (Habitats).
Stamford, Connecticut: Thompson Learning, 1995.
Notes the ways in which isolation has spawned wondrous life forms and ecosystems.

Web Sites

NOVA Online—Garden of Eden
www.pbs.org/nova/eden/
Explores the unique island chain called the Seychelles, a thousand miles east of Kenya. The Seychelles harbor plants and animals as unique as a frog the size of a rice grain and a coconut seed weighing 40 pounds. Delves deeper into this laboratory of evolution through articles, activities, resource links, and more. Launch date: Friday, November 24.

Seychelles
www.seychelles.uk.com/main.htm
Provides information about the Seychelles from the United Kingdom's Seychelles Tourist Office, including where the islands are located and facts about their natural history.

Dying to Be Thin

Airs the week of December 12 • www.pbs.org/nova/thin/

Program Contents

NOVA investigates the causes, complexities, and treatments for the eating disorders anorexia nervosa and bulimia nervosa.

The program:

- chronicles the struggles of girls and women who have had, or currently have, anorexia or bulimia.
- reviews the medical complications associated with prolonged starvation.
- explains that an estimated 8 million people suffer from anorexia and bulimia, that at least three of every 100 adolescent girls will develop anorexia or bulimia, and that although men rarely suffer from the disorder the rate among men appears to be increasing.
- investigates why eating disorders are a growing problem.
- examines how culture contributes to eating disorders by reinforcing what is considered beautiful through repeated exposure to thin role models.
- highlights the important aspects of successful treatment for people with anorexia or bulimia.
- profiles one supermodel's journey from struggling with anorexia to accepting her natural weight and ultimately becoming a highly successful plus-size fashion model.
- points to psychotherapy as one of the most critical components to recovery.

Before Watching

1. Ask students to write down *anonymous* answers to the following questions: Have you thought about your weight in the last day? week? month? year? almost never? Have students note whether they are male or female. Collect students' answers and tally them by gender. Report the findings to the class and analyze the results.

2. As they watch, have students note ideas some people have about ideal body weights.

Kate Dillon, featured in "Dying to Be Thin," is now a highly successful plus-size model.

After Watching

1. Discuss what students saw regarding ideal body weight. Did students relate to anything in the show? Where else do they see those attitudes? What other attitudes exist about weight?

Activity Setup

Objective

To collect and analyze data about how healthy men and women are portrayed in the media and use this data to learn more about healthy lifestyles.

Materials for each student

- copies of magazines typically read by teen boys and girls, such as *YM*, *Teen*, *Seventeen*, *Sport*, and *Sports Illustrated*
- copy of ***Body Images*** activity sheet on page 24
- graph paper
- lined paper for collecting data
- protractors
- calculators

Procedure

1. Have students bring in copies of magazines from home that are suitable for the classroom.
2. Distribute the ***Body Images*** activity sheet to students. Review the data they will be collecting and ask students whether they would like to collect any additional data.
3. Have students collect the data from the first 25 pages and the final five pages of the magazines, including the covers. Stress that it is important to be as accurate as possible to get useful results.
4. Once students have collected their data, tell them to make a bar graph and a pie graph for each of their data charts.
5. Have students pool their results and then on paper or the chalkboard, make another bar graph and pie graph to represent the entire data set. Have students analyze the class data, and answer the questions on their activity sheets. Are people portrayed the same in different types of magazines?
6. To conclude the lesson, have students consider their own views of self-image. Have students *self-reflect* on the following questions: Do you feel any pressure to have a body like those portrayed in the media? Do you know anyone who has gone on a diet and lost a lot of weight? Do you know what kind of a diet he/she used to lose weight? Was he/she able to keep the weight off? Explain. Have you ever been on a diet to lose or gain weight? What motivated you to go on the diet? Were you successful? Where did you get information about the diet? If students want to generate a discussion, take responses from volunteers only and be sensitive to the feelings of class members.
7. As an ***extension***, have students consider whether the men and women portrayed in advertisements are real. Do they think the photos may have been touched up? If so, how? and why?

Standards Connection

The activity found on page 24 aligns with the following *National Science Education Standards*.

Grades 5-8

Science Standard A:
Science as Inquiry

Abilities necessary to do scientific inquiry

- Use appropriate tools and techniques to gather, analyze, and interpret data.

Science Standard F:
Science in Personal and Social Perspectives

Personal health

- Regular exercise is important to the maintenance and improvement of health. The benefits of physical fitness include maintaining healthy weight, having energy and strength for routine activities, good muscle tone, bone strength, strong heart/lung systems, and improved mental health.

Grades 9-12

Science Standard F:
Science in Personal and Social Perspectives

Personal and community health

- Personal choice concerning fitness and health involves multiple factors. Personal goals, peer and social pressures, ethnic and religious beliefs, and understanding of biological consequences can all influence decisions about health practices.

Body Images

NOVA Activity I **Dying to Be Thin**

Do the images you see in magazines reflect the people you see in real life? Conduct a scientific survey and see what the images reveal.

Procedure

① Choose a magazine that you either read on a regular basis or might like to read.

② Make four charts like the ones below on separate pages. Mark a line in each appropriate box to represent each person's body type on the magazine page. Make a chart for any additional data you would like to collect.

③ Collect data from the magazine you have chosen.

④ Count the marks for each of your body types and make a bar graph and a pie graph for each one of your data charts.

⑤ Combine your data with those from other groups. Once this is done, your teacher will create a final pie graph and bar graph to represent everyone's data.

Name of Magazine: _____

Date of Issue: _____

MALE MODELS

Page #	Number of Male Models	Models were: Large	Average	Thin

FEMALE MODELS

Page #	Number of Female Models	Models were: Large	Average	Thin

ARTICLES ABOUT WEIGHT OR DIET ISSUES

Page #	Article Title	Articles were about: Diet	Exercise	Self-Esteem	Fashion

ADS FOR RELATED PRODUCTS

Page #	Article Title	Product was for: Reducing Weight	Increasing Weight	Food	Exercise

Questions

Write your answers on a separate sheet of paper.

① Write a paragraph or two describing your magazine's message to its readers about the normal or acceptable male or female body. Does this view match what you see as normal body types in the general population? Explain.

② Examine the results of your review of the articles. Do the articles give the same message about acceptable body types as the pictures? Is this message generally positive or negative about average body types? Explain. What was the ratio of advertisements to articles?

③ Do the advertisements in the magazine support the ideas expressed by the pictures? What specific kinds of body-related products are advertised? Were healthy foods advertised? Did the models in the advertisements give direct support to the product, or did they seem to be secondary?

④ Analyze the final class bar graph and pie graph. What patterns do you see? How did the final graphs compare to the ones you made in your group?

Activity Answer

The attractive human body, as portrayed in the media, has changed during the years. In the late 1800s products supported, and advertisements showed, what would today be called "overweight models." Times have changed drastically. Because people today are living in what has been called "the information age," the influence of the media is greater than ever. Most Americans are exposed to thousands of media messages every day in print, on television, through outdoor advertising, and over the Internet. These messages promote bodies that are thin and idealistically well proportioned. Overweight people are seldom seen even in television programming unless they are featured in comedy shows or comic characterizations.

Student analyses of the magazines will show that nearly all the women in the general circulation magazines are thin; in fact most weigh less than the lowest weight for their heights on standard height and weight charts. Few average size or large women ever appear unless they are there as part of a special article or advertisement.

Men are usually portrayed as well proportioned with broad muscular shoulders and flat stomachs. Like women, few if any overweight or overly thin men ever appear. Exceptions are articles about athletes who might need to be big to excel in their sport, like football linemen, or some wrestlers.

Articles in magazines aimed at girls and women often promote dieting and exercise to change body weight, and are rarely accepting of the body that the girl has. Similar results are found in magazines that boys read. These articles sometimes promote dieting and leave the reader with a poor self-image, feeling that their body is anything but perfect. The message is that anyone could have a perfect body with the right diet and sufficient exercise, which is not true.

Advertisements almost always portray idealized images of attractive female and male models. These people appear even when the product being advertised has nothing to do with body shape or size, instead seeking to give the reader the impression that there is somehow a link between the two. Some advertisements found in the back of magazines recruit young women (and sometimes young men) to summer camps where they can have fun while losing as much as 50 pounds. What they don't say is that almost all of the dieters will gain most or more weight back by the following summer, because they go home to the same temptations.

Most every student will know someone with a weight problem, someone who successfully completed a diet but regained the weight later, or a friend or acquaintance who struggles with anorexia or bulimia. Share that the best advice for these friends is to get professional help. With help these problems can be overcome. If not, some may lead to death.

Resources

Books

Anderson, Arnold, Leigh Cohn, and Thomas Holbrook.
Making Weight: Men's Conflicts with Food, Weight, Shape, and Appearance.
Carlsbad, California: Gürze Books, 2000.
Explores why many men today are experiencing problems that have traditionally been considered women's issues, and offers practical solutions for men who are suffering from anorexia, bulimia, compulsive overeating, excessive exercise, steroid abuse, sexual uncertainty based on appearance, or body dissatisfaction.

Sneddon, Pamela Shires.
Body Image: A Reality Check.
Springfield, New Jersey:
Enslow Publishers Inc., 1999.
Describes the problems with body image, the reasons some people have a poor body image, and how self-perception is affected by society.

Web Sites

NOVA Online—Dying to be Thin
www.pbs.org/nova/thin/
Delves deeper into the complex factors that lead to eating disorders like anorexia nervosa and bulimia nervosa, with features including interviews, articles, and activities. Examines the therapies that can help in the relief of these disorders and offers links to additional resources. Launch date: Friday, December 8.

Anorexia Nervosa & Related Eating Disorders
www.anred.com/
Offers a wealth of information on eating and exercise disorders among men and women, including definitions, statistics, warning signs, medical and psychological complications, and recovery information.

Eating Disorders Awareness and Prevention
www.edap.org/
Includes information about Eating Disorders Awareness Week, a healthy body image curriculum for grades 4–6, and links to additional resources. Sponsored by the nation's largest nonprofit organization devoted to the awareness and prevention of eating disorders.

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Japan's Secret Garden

Airs the week of December 19 • www.pbs.org/nova/satoyama/

Program Contents

NOVA illustrates how the seasonal rhythms of Japan's long-standing rice paddies—from wet to dry to wet again—has created a unique environment that sustains a rich variety of animal, insect, plant, and human life.

The program:

- shows how spring mountain water released into the fields reawakens dormant life.
- reviews the many species that gather from near and far when the fields are flooded, a number that eventually will include more than 1,000 species of insects.
- follows the birth of many species as the days grow warmer.
- explores the predator–prey relationships that take place in the paddies.
- summarizes the role of the nearby woodlands as a water reservoir for rain and a source of food, firewood, charcoal, and oak tree limbs for growing shiitake mushrooms.
- relates how Japanese laborers work the rice paddies and worship the forces of nature that govern them.
- indicates how, as fall and winter approach, species react in different ways—by leaving the fields, hibernating, or depositing eggs that will hatch in spring.

Before Watching

1. Rice is one of the world's main food crops. It is grown in fields that are flooded every year. Organize students into two large groups. As they watch, have half of the class record the steps from the flooding of the fields to the harvest and the other half note the animals that have adapted to the seasonal cycle.

A dragonfly larva hunts water fleas, an easy prey. More than 1,000 different insect species find what they need in the flooded rice fields.

After Watching

1. Discuss the steps in growing the rice that students recorded and the living things that adapted.

2. In addition to being a food staple, rice plays a part in many Asian customs, beliefs, rituals, and celebrations. What foods do students eat that are part of cultural family celebrations?

Activity Setup

Objective

To classify insects as helpful or harmful to society by collecting, analyzing, and interpreting information.

Materials for each student

- copy of the *Insects: Villains or Heroes?* activity sheet on page 28
- posterboard or art paper
- reference books, magazines, and Internet access for research
- art materials, such as markers or crayons, rulers, and scissors

Procedure

1. Discuss the characteristics of insects. (See *Activity Answer* on page 29 for more information.)
2. Give each student a copy of the *Insects: Villains or Heroes?* activity sheet.
3. Ask the class to brainstorm a list of insects. List these on the chalkboard or on an overhead transparency for students to see. Add any to the list that students might not have considered. These can be found in print reference materials or on one of the suggested Web sites.
4. Allow students to select one of the insects from the list to research but try to make sure that only one student is researching any one insect.
5. Brainstorm with students the information they need to find out about their insect, such as common name; kingdom, phylum, class, and order; physical description; habitat; food source; carnivore or herbivore; special conditions needed for reproduction; and lifespan.
6. Provide access to reference materials, including the Internet if possible, for students to find the necessary information about their insects.
7. Have students determine the helpful and/or harmful aspects of their insect.
8. Organize students into groups and have them report on the aspects of their insects. Once they have reported, have students determine which argument is most persuasive and why, and create a Wanted Poster or Certificate of Achievement based on their conclusions.
9. Display all completed work, giving students an opportunity to justify their classifications of the insects they researched.
10. Conduct a class discussion to measure agreement or dissatisfaction with the classifications.

Standards Connection

The activity found on page 28 aligns with the following *National Science Education Standards*.

Grades 5-8

Science Standard F:
Science in Personal and Social Perspectives

Risks and benefits

- Individuals can use a systematic approach to thinking critically about risks and benefits. Examples include applying probability estimates to risks and comparing them to estimated personal and social benefits.
- Important personal and social decisions are based on perceptions of benefits and risks.

Grades 9-12

Science Standard F:
Science in Personal and Social Perspectives

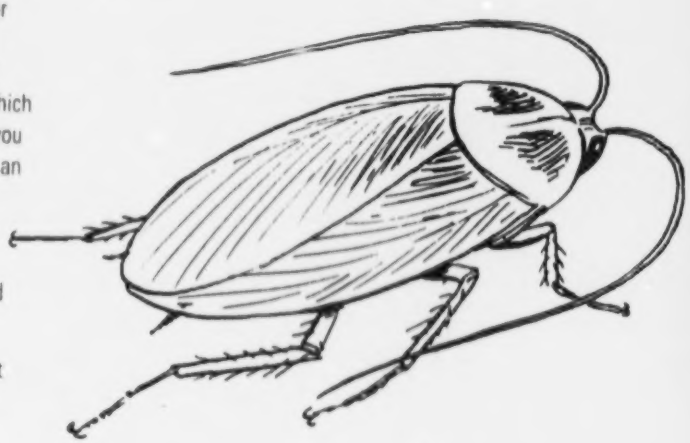
Natural and human-induced hazards

- Natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society, as well as cause risks. Students should understand the costs and trade-offs of various hazards—ranging from those with minor risk to a few people to major catastrophes with major risk to many people.

Insects: Villains or Heroes?

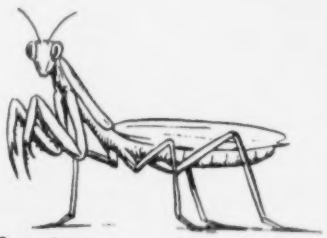
NOVA Activity I **Japan's Secret Garden**

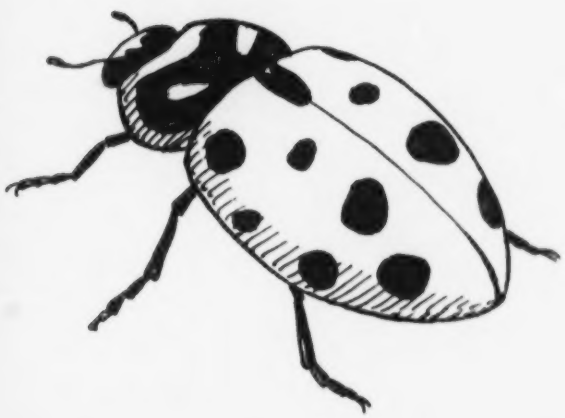
Insect control is big business. People across the world pay billions of dollars each year to control insects that invade crops, lawns, and foundations. Insect bites or stings can also transmit disease. At the same time other insects, like ladybugs, eat potentially harmful insects and bees fertilize plants and make honey, which serves as food for other animals. This activity asks you to analyze which characteristics determine whether an insect is categorized as useful or detrimental.



Procedure

1. Brainstorm with your classmates a list of insects and select one of them to research.
2. Decide the information you will need to collect about your insect.
3. Conduct research on your insect and analyze the information that you collected.
4. Decide whether your insect serves a useful purpose or whether it is harmful in its encounters with humans. Present the aspects of your insect to other students in a group and decide whether your insect should be classified as mostly harmful or helpful.
5. Based on your conclusion, design either a Wanted Poster or Certificate of Achievement for your insect. Include a picture and as much of the information you collected as is necessary to explain why you classified the insect as you did.
6. Share your results with other class members.





Questions

Write your answers on a separate sheet of paper.

1. Were any of your preconceived notions about insects incorrect? What were they?
2. Were any of the classifications difficult to make, that is, did some of the insects have both helpful as well as harmful aspects?
3. What is the most helpful insect in your area? What is the most harmful? Explain the reasoning for your choice. Predict the effects if either of those insects were eliminated.

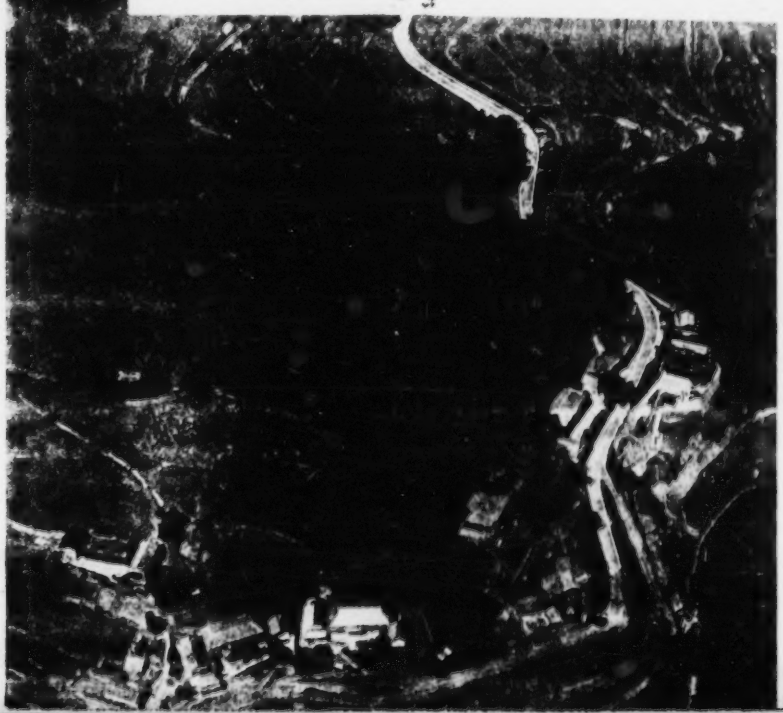
Activity Answer

Insects are the largest class of the phylum Arthropoda. Their class within the phylum, Insecta, is distinguished by the following characteristics: Their bodies are divided into three sections, the head, the thorax and the abdomen. They have three pairs of legs that connect to the thorax.

The activity requires the class to make some value judgments about insects. Those that might be considered harmful by some people, in reality play important roles in the environment. Many of the insects provide food for fish and birds. Insects play an important role in fertilizing flowers on vegetable plants and fruit trees. Even the maggots that devour dead animals, and the beetles that chew fallen trees play an important role. On the other hand, other insects carry disease that poses a threat to human and other animal life. Some insects destroy crops.

Humankind's efforts to control insects with pesticides could have great effects on the environment. For example, DDT was used extensively to control insects before its detrimental effects on other animals were noted. Insecticide can find its way into the water supply where it can hurt animals, plants, and even insects miles away. Insecticide can enter the food chain and can be concentrated in animals at the upper end of the food pyramid, which contains animals humans eat, like fish. Also, some bugs become resistant to insecticides over time.

While many people like honey, how many of them would allow a large swarm of bees to live in their backyard? Students need to understand that insects can have both positive and negative impacts.



Resources

Books

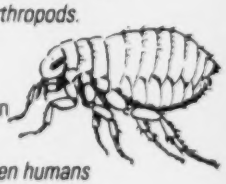
Evans, Arthur V., Charles L. Bellamy, and Lisa Charles Watson.
An Inordinate Fondness for Beetles.
Berkeley, California: Univ. of California Press, 2000.
Recounts the natural history as well as the human history of beetles. An authoritative reference with breathtaking photographs; newly available in paperback.

Lowenstein, Frank, and Sheryl Lechner.
Bugs: Insects, Spiders, Centipedes, Millipedes and Other Closely Related Arthropods.
New York: Black Dog & Leventhal Publishers Inc., 1999.
Layperson's guide to the habits and bizarre physical features of some of the most successful creatures on Earth.

Facklam, Howard, and Margery Facklam.
Insects (Invaders).
New York: Twenty First Century Books, 1995.
Offers an understanding of insect behavior and adaptation strategies.

Article

"Insect Variety."
Kids Discover, September 1999, 4.
Describes how no animal group better exemplifies biodiversity than insects and other arthropods.



Web Sites

NOVA Online—Japan's Secret Garden
www.pbs.org/nova/satoyama/
Examines the intricate balance between humans and nature evidenced in the foothills surrounding Lake Biwa in Japan. Details how generations of farmers have transformed this land into ingeniously engineered terraces that support both rice cultivation and an abundance of wildlife. Offers additional information on this Japanese concept of "satoyama" through interviews, articles, resource links, and more. Launch date: Friday, December 15.

Bugbios
www.insects.org/links/index.html
Provides a variety of links to more information about insects.

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Video Catalog

Now two ways to save!

Save 15%* on orders of 3 videos or more

Save 25%* on orders of 10 videos or more

This is not a complete listing of NOVA videos. Please call 1 800 949 8670 ext. 0200 for a free catalog.

These videos have been categorized by their primary content strand; many programs are interdisciplinary. You may want to scan several categories for videos of interest.

Special 25% Savings

Special! For Educators Only!

Receive a special set of the *NOVA* videos featured in this Fall 2000 Teacher's Guide for only $104.95, plus shipping and handling. Set includes: *Dying to be Thin, Garden of Eden, Hitler's Lost Sub, Japan's Secret Garden, Lincoln's Secret Weapon, Runaway Universe* and *Super Bridge*. 9 hrs. on 7 cassettes. *Educational use only.* **WG1034**
Available January 2001.

Earth & Space Science

Buried in Ash

Learn what life was like ten million years ago when a volcanic eruption buried much of what is now Nebraska in up to ten feet of ash.
1 hr. **WG2117* $19.95**

Chasing El Niño!

Lethal ice storms, droughts, floods and devastation—what in the world is going on here? *NOVA* explores the myths, reveals the devastation, explains the fascinating facts and provides a new climate for understanding the ultimate weather machine.
1 hr. **WG2512 $19.95**

Deadly Shadow of Vesuvius

Scientists believe it's only a matter of time before Italy's Vesuvius erupts...again. Find out how science can help predict when Vesuvius will change from dormant to destructive.
1 hr. **WG2515 $19.95**

The Doomsday Asteroid

Join the hunt to scan the skies and earth for evidence that giant rocks from outer space have struck before and will strike again. *Educational use only.* 1 hr. **WGDZ212* $19.95**

Earthquake

Predicting earthquakes is risky business, but *Earthquake* shows how today's advanced technology helps geologists interpret nature's rumblings. 1 hr. **WG1715* $19.95**

Eclipse of the Century

The race to view and study celestial splendor.
1 hr. **WG1910 $19.95**

Flood!

Relive one of the greatest flood disasters—the Mississippi River in the summer of 1993—and explore the problem of taming the mightiest river.
1 hr. **WGZ307 $19.95**

Hunt for Alien Worlds

All eyes are on the heavens in search of planets around other stars, probably the best hope for showing that we may not be alone in the universe. *NOVA* covers an effort that is turning up more and more new worlds. *Educational use only.*
1 hr. **WG2407* $19.95**

Natural Disasters Boxed Set

Natural disasters strike with little or no warning—making them uniquely frightening and fascinating. Includes *The Day the Earth Shook, Tornado!*, and *In the Path of a Killer Volcano.*
3 hrs. on 3 cassettes **WG165 $49.95**

Nature's Fury Boxed Set

Witness the awesome power of nature. Includes *Hurricane!, Lightning!* and *Killer Quake!*. 3 hrs. on 3 cassettes **WG027 $49.95**

NEW! Runaway Universe

Astronomers have recently theorized that the universe may actually be flying apart at the seams. An accelerating universe would mean that some unknown repulsive force must be counteracting gravity—an idea that some scientists reject as impossible. Watch as scientists race to confirm their astonishing observations, and to grapple with the ultimate question: what is the size and shape of the universe, and how will it all end? 1 hr. **WGZ713 $19.95**
Available December 2000.

Space Explorers Boxed Set

Step on the moon. Float in space. Explore the final frontier. *NOVA* assembles three of its most acclaimed space adventures to create this special four-hour set. Includes *To the Moon, Terror in Space* and *Rescue Mission in Space*. 4 hrs. on 3 cassettes.
WG667 $49.95

Stationed in the Stars

Go inside the planning, assembly and excitement of history's most ambitious and expensive engineering venture—a hugely ambitious "orbiting city" set for completion in 2004.
Educational use only. 1 hr. **WGZ708 $19.95**

To The Moon

This expanded two-hour special shares vivid recollections of Apollo astronauts Gene Cernan and Frank Borman, and introduces you to legendary Flight Director Gene Kranz and other unsung heroes of the entire space program. Rare interviews and amazing footage capture America's full-thrust effort to be the first to the moon.
2 hrs. **WG2610 $19.95**
NEW! DVD 2 hrs. **WG998 $19.95**

Warnings from the Ice

Huge ice sheets in Antarctica may be in the process of collapse, triggering a catastrophic rise in sea level that will inundate the most populous regions of the world. Join *NOVA* as they gather data that will reveal new insight into the nature of global climate change.
1 hr. **WG2508 $19.95**

NEW! What's Up with the Weather?

In this special two-hour program, *FRONTLINE* and *NOVA* take on one of the most complex and important challenges facing the world today—global warming. Take a dramatic journey to find out what's in store for our Earth's climate system.
2 hrs. **WG904 $19.95**

General Science

Anastasia Dead or Alive?

Investigate the massacre of Tsar Nicholas and his family, and evaluate whether modern science has resolved the mystery surrounding Princess Anastasia. 1 hr. **WGA2209 $19.95**

B-29 Frozen in Time

Join a grueling expedition to recover this rare plane from the North Pole after 50 years—a trip which tests team members in ways they never imagined. 1 hr. **WG2303 $19.95**

The Beast of Loch Ness

Is the Loch Ness Monster a hoax? Join *NOVA* for an all-out investigation of the mystery as scientists scour the loch with sonar and the most famous photo of Nessie is put to the test.
1 hr. **WG2601 $19.95**

NEW! Building Big with David Macaulay Boxed Set

Award-winning author-illustrator—and captivating storyteller—David Macaulay (*The Way Things Work*) goes to extremes with five extra-large adventures that explore the greatest man-made wonders of the world: *Bridges, Dams, Domes, Tunnels* and *Skyscrapers*. The series introduces the courageous creators and builders and reveals the deadly disasters and personal triumphs behind these breathtaking structures. Spectacular film footage, dramatic recreations, and David's uniquely illuminating illustrations will excite, explain, and entertain in a big way.
5 hrs. on 5 cassettes **WG965 $69.95**
Available October 2000.

NEW! Building Big with David Macaulay Educational Curriculum

Exclusively for educators! The *Building Big with David Macaulay* boxed set, plus a 40-page, full color activity guide and a bonus video that explores the basic engineering principles behind skyscrapers and includes five hands-on building activities hosted by two of the kids from the hit PBS show *ZOOM*. 5.5 hours on 6 cassettes
WG982 $99.95 *Available October 2000.*

Decoding Nazi Secrets

Historic, fascinating and filled with stunning revelations, *NOVA* presents the first fully detailed account of the greatest codebreaking coup of all time. In this two-hour special, hear American and British codebreakers reveal long-held secrets for the first time. 2 hrs. **WG2615 $19.95**

The Diamond Deception

What takes nature billions of years, man is doing now in a few days—creating flawless diamonds. *Educational use only.* 1 hr. **WG2703 $19.95**

ESCAPE! Because Accidents Happen Boxed Set

In the air, at sea, on the road, or in your home, you must be prepared to escape! *NOVA* goes behind the sensational headlines to examine the fascinating science of "survival engineering." Includes *Fire, Car Crash, Plane Crash* and *Abandon Ship*. 4 hrs. on 4 cassettes **WG260 $49.95**

Everest: The Death Zone

Climb all the way from Base Camp to the very pinnacle of the earth at 29,028 feet. You'll witness first-hand why rational people can make astonishingly poor, and sometimes fatal decisions, on the world's highest peak. Narrated by Jodie Foster. By David Breashears, the Emmy® award-winning producer of the IMAX film.
1 hr. **WG2506 $19.95**
DVD 1 hr. **WG800 $19.95**

Everest: The Mystery of Mallory and Irvine

Did George Mallory and Andrew Irvine reach the top of Mt. Everest in 1924, nearly 30 years before Sir Edmund Hillary and Tenzing Norgay? This award-winning film, produced by renowned climbers and filmmakers David Breashears and Andrew Harvard, takes a fascinating look at Mallory's courageous attempt and the enduring mystery surrounding his disappearance.
1 hr. **WG830 $19.95**

Fall of the Leaning Tower

Tilting at an amazingly dangerous angle, the Leaning Tower's problem is obvious—its solution isn't. See how science is attempting to save a medieval masterpiece with a high-risk rescue plan that may add centuries to the life of this architectural treasure. 1 hr. **WG2611 $19.95**

NEW! Hitler's Lost Sub

How could a German u-boat from World War II have gone undetected only 60 miles off the New Jersey shore? In this two-hour special, *NOVA* traces the mysterious history of the boat, develops a convincing picture of what took place on the sub's final patrol and recovers parts of the sub long buried beneath the sea.
2 hrs. **WG2712 $19.95** *Available December 2000.*

NEW! Holocaust On Trial

The Final Solution and the slaughter of millions of Jews during World War II are the darkest tragedies of the 20th century. Yet there are some that claim that the Holocaust is a myth, and deny that millions were systematically killed. *NOVA* investigates how a vocal minority continues to challenge the reality of the Holocaust, nearly 50 years later. *Educational use only.*
1 hr. **WG2711 $19.95** *Available November 2000.*

Ice Mummies Boxed Set

You're there as the ice mummies are unearthed, as clothing and artifacts are studied, and as mysteries of the Stone Age are explained. Includes *Frozen in Heaven, Siberian Ice Maiden* and *Return of the Iceman*.
3 hrs. on 3 cassettes **WG2525 $49.95**

In Search of Human Origins Boxed Set

The award-winning exploration of the beginnings and expansion of the human race. Includes *The Story of Lucy, Surviving in Africa* and *The Creative Revolution*.
3 hrs. on 3 cassettes **WGW2111 $49.95**

In Search of the First Language

NOVA explores the common threads that link the more than 5,000 languages of Earth. *Educational use only.* 1 hr. **WG2120* $19.95**

The Killer's Trail

Did Dr. Sam Sheppard kill his wife? With the help of advanced technology, *NOVA* re-examines the 1954 murder of Marilyn Sheppard and the subsequent trials of her husband. America's most intriguing unsolved murder reveals fascinating new clues...and surprising new suspects. 1 hr. **WG2613 $19.95**

NEW! Lincoln's Secret Weapon

Watch as expert divers try to retrieve the *USS Monitor* from the bottom of the ocean. This historical warship was commissioned during the Civil War and was one of the first armored combat vessels, and the precursor to today's high-tech submarines. 1 hr. **WG2710 $19.95**
Available November 2000.

Lost at Sea: The Search for Longitude

Richard Dreyfuss narrates this riveting story of an ingenious country carpenter who discovered that the secret to navigation lay not just in the stars but in the mastering of time. Climb aboard an authentic tall ship and go back in time to see the quest for longitude unfold.
1 hr. **WG2511 $19.95**

Lost on Everest

The discovery of mountain-climbing pioneer George Mallory's body on Mt. Everest in May 1999 reveals new clues to his final hours and mountaineering's most haunting mystery. 1 hr. **WG2702 $19.95**

Lost Tribes of Israel

Nearly 3,000 years after their banishment, *NOVA* dispels both myth and fantasy in a dramatic genealogical quest that uses DNA evidence in the search for alleged descendents of Israel's Lost Tribes. 1 hr. **WG2706 $19.95**

A Man, A Plan, A Canal, Panama

Explore the mind-boggling construction of the Panama Canal through historic film footage, rare archival photographs and insightful narration from author-historian David McCullough. Get an unprecedented look at the people behind the Canal's deadly 30-year construction and witness its amazing present-day operation.
1 hr. **WG1415 $19.95**

Mystery of the First Americans

NOVA uncovers the astonishing history and explains the current Native American controversy over Kennewick Man—a 10,000-year-old Caucasoid discovered near Washington's Columbia River in 1996. 1 hr. **WG2705 $19.95**

Mysterious Mummies of China

Perfectly preserved 3,000-year-old mummies have been unearthed in a remote Chinese desert shedding new light on the contact between the East and West in the ancient world. But these don't appear to be the ancestors of the modern-day Chinese people—they have long, blonde hair and blue eyes. 1 hr. **WG2502 $19.95**

The Science of Crime Boxed Set

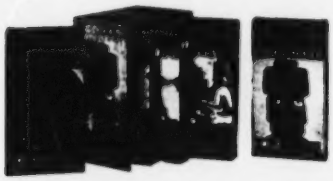
Serial criminals wield a particular brand of terror. Fortunately for us, scientific sleuths are on their trail. Includes *The Bombing of America, Mind of a Serial Killer* and *Hunt for the Serial Arsonist*. 3 hrs. on 3 cassettes **WG164 $49.95**

Search for the Lost Cave People

Discover a lost civilization that inhabited caves high on the isolated cliffs of Southern Mexico nearly 1,000 years ago. The tantalizing clues, including graphic evidence of ritual child sacrifice and a sophisticated writing system, shed new light on this mysterious people, the Zoqui.
1 hr. **WG2507 $19.95**

Secrets of Lost Empires Boxed Set

Uncover the secrets of ancient civilizations as *NOVA* journeys to five archaeological sites where teams of experts use traditional techniques to test their hypotheses. Includes *Colosseum, Inca, Obelisk, Stonehenge* and *Pyramid*. 5 hrs. on 5 cassettes **WG182 $69.95**



Secrets of Lost Empires II Boxed Set

Filled with powerful recreations and revealing insights, this ambitious *NOVA* series examines five ancient civilizations and their unique impact on the past...and on the future. Includes *Medieval Siege, Pharaoh's Obelisk, Easter Island, Roman Bath* and *China Bridge*.
5 hrs. on 5 cassettes **WG898 $69.95**

Secrets of Making Money

Learn the secrets of counterfeiting—made easier by today's technology—and find out what the Feds are doing to fight back.
1 hr. **WG2314* $19.95**

Submarines, Secrets and Spies

NOVA lifts the veil on deadly, mysterious submarine accidents and high-risk spy missions through candid interviews with Soviet and U.S. military personnel, shocking underwater footage and recently declassified film and documents. 1 hr. **WG2602 $19.95**

Three Men and a Balloon

For a few diehard daredevils, it's "the last great challenge in aviation"—to fly a balloon non-stop around the world. Follow one of the foremost teams in a hair-raising race against time, technology, and hot competition.
1 hr. **WG2313 $19.95**

Titanic's Lost Sister

Search for the wreck of the *Britannic* and explore the clues as to how it sank. Four years after the *Titanic* went down, the *Britannic* sank in just one hour, despite an overhaul to meet post-*Titanic* standards. 1 hr. **WG2402 $19.95**

Treasures of the Sunken City

It's an undersea adventure in Cleopatra's erstwhile capital. Alexandria, Egypt, where marine archaeologists are frantically salvaging mysterious stone ruins from the harbor floor.
1 hr. **WG2417 $19.95**

UFOs: Are We Alone?

Using rare UFO footage, *NOVA* investigates the claims of sightings. 1 hr. **WGW262 $19.95**

NEW! The Vikings

This riveting two-hour special investigates a new image of the Vikings that goes far deeper than their savage stereotype as raiding marauders. Faithful replicas of their magnificent ships, life-like computer animation and fascinating recreations reveal the Vikings as canny merchants, expert shipbuilders, superb artisans, and bold colonizers of lands that lay beyond the edge of the known world. 2 hrs. **WG958 $19.95**

Voyage of Doom

The recent discovery of *Belle*, part of the fleet of fanatical French explorer Robert La Salle, has been called the most important shipwreck find in North America. Lying mud-covered and remarkably preserved on the bottom of a Texas bay, *Belle*'s final resting place was unfortunate for La Salle, but incredible for historians and archaeologists. Join the unprecedented excavation effort as *NOVA* reveals *Belle*'s vivid history, incredible artifacts and mysterious details. 1 hr. **WG2616 $19.95**

Warriors of the Amazon

See a rare glimpse of life today for the Yanomami, who live in a remote and inhospitable part of the Amazon rain forest. 1 hr. **WG2309 $19.95**

Life Science

Animal Hospital

Go behind the scenes for this offbeat, sometimes humorous, sometimes sad portrait of pets, their owners and their vets and the drama that unfolds everyday in homes, zoos and veterinary hospitals. 1 hr. **WG2504 $19.95**

The Brain Eater

Scientists race to determine whether a variant of mad cow disease spells a deadly epidemic for humans. *Educational use only.* 1 hr. **WG2505* $19.95**

Can Buildings Make You Sick?

Join *NOVA*'s quest to uncover baffling cases of bad air found in offices, schools, homes and even hospitals! *Educational use only.* 1 hr. **WG2217* $19.95**

Coma

In a gripping real-life drama, *NOVA* follows famous neurosurgeon Jam Ghajar as he struggles to save a young boy with massive head trauma, using simple but crucial techniques that are dangerously absent from most hospitals across the country. 1 hr. **WG2411 $19.95**

NEW! Dying To Be Thin

An epidemic of eating disorders is spreading through America's youth, a contagion fanned in part by the media's obsession with waif-like celebrities. *NOVA* investigates the dark side of today's image-obsessed youth culture, examining the roots of anorexia and bulimia and the new therapies that are beginning to restore hope to the afflicted. *Educational use only.* 1 hr. **WG2707 $19.95** *Available January 2001.*

Ebola: The Plague Fighters

The Ebola virus and its devastating impact is profiled as *NOVA* travels behind the quarantine line to observe the scientists battling to contain this most deadly of viruses. 1 hr. **WG2304 $19.95**

NEW! Garden of Eden

The Seychelles, often referred to as the Garden of Eden, is a stunningly beautiful island chain. This tropical archipelago off the coast of Kenya is home to a dazzling array of exotic plants and animals and is also a scientific wonderland due to the incredibly unspoiled nature of the islands and their wildlife. 1 hr. **WG2714 $19.95** *Available December 2000.*

Island of the Spirits

Mystical, magical and marvelous, Japan's northernmost island, Hokkaido, is filled with steaming lakes, fairy tale forests and wildlife as varied and unique as its terrain. Dazzling photography captures a year in the life of its rare inhabitants. *Educational use only.* 1 hr. **WG2614 $19.95**

NEW! Japan's Secret Garden

Follow a year in the life of a Japanese farm located on the shores of Lake Biwa, one of Japan's most pristine freshwater lakes. See how local farmers have developed a unique balance between humans and nature that continues to support rice fields and catfish ponds after over 2000 years of agriculture. 1 hr. **WG2716 $19.95** *Available January 2001.*

Kingdom of the Seahorse

Witness a remarkable fish whose male becomes pregnant and gives birth. Tour the magical and complex world of the seahorse—from an underwater enclave in Australia to a village in the Philippines dependent on the seahorse for survival. 1 hr. **WG2410 $19.95**

Life's First Feelings

A look at babies' emotional responses, clues about developing personality traits and how parents help with socialization. 1 hr. **WG9304* $19.95**

Little Creatures Who Run the World

Peer close-up into the worlds of the most amazing ants and understand why some believe ants are the most successful life form on earth. 1 hr. **WG2203 $19.95**

MD: The Making of a Doctor

In this two-hour special, *NOVA* follows seven aspiring doctors as they undergo the exhilarating and rigorous years of medical training. 2 hrs. **WG2207 $19.95**

The Miracle of Life

This Emmy® award-winning classic brings you along on an incredible microphotographic voyage through the human body as a new life begins, including the moment of conception. 1 hr. **WG001 $19.95** DVD 1 hr. **WG799 $19.95**

Mystery of the Animal Pathfinders

Travel to bird feeding grounds in Brazil, bat caves in Mexico and eel habitats in Maine to understand the mystery of animal migration. 1 hr. **WGW710* $19.95**

Night Creatures of the Kalahari

When the sun sets over southern Africa, the grasslands' strangest and most secretive residents sneak out from their lairs. Witness bush babies, meerkats, striped polecats, brown hyenas, flying termites, and more rarely seen exotic creatures. 1 hr. **WG2501 $19.95**

The Private Lives of Dolphins

Discover the deep-sea drama of life for the ocean's most charming and sophisticated mammals. 1 hr. **WG1917 $19.95**

Rescuing Baby Whales

Join the dramatic rescue of young, stranded pilot whales, and learn what is behind this puzzling phenomenon. 1 hr. **WG1908 $19.95**

Shark Attack!

Are sharks developing a taste for human flesh? Join *NOVA* scientists as they discover some surprising truths about the way sharks kill. 1 hr. **WG2316 $19.95**

Surviving AIDS

Journey with *NOVA* to meet the scientists, physicians, and courageous patients whose cutting-edge experimentation and heroic acts will help achieve the ultimate goal: transforming every AIDS patient into a long-term survivor. 1 hr. **WG2603 $19.95**

Tales from the Hive

Using specially developed camera lenses, *NOVA* brings you the most intimate—and most spectacular—portrayal of a working bee colony ever filmed. 1 hr. **WG2701 $19.95**

Treasures of the Great Barrier Reef

Visit Australia's greatest natural wonder, and view the undersea world's brilliant colors and extraordinary inhabitants. 1 hr. **WG2215 $19.95**

The Universe Within

Travel on an extraordinary visual tour inside the human body, with microphotography and computer animation achieved by the creators of *The Miracle of Life*. 90 min. *Educational version:* **WG2206A* $19.95** 1 hr. **WG2206 $19.95**

Volcanoes of the Deep

The pitch-black, near-freezing water nearly 8,000 feet below the ocean surface is the last place you'd suspect life to flourish. But here sea life thrives on mammoth superheated volcanic chimneys. Is the key to life's origins locked inside their fiery cores? 1 hr. **WG2609 $19.95**

Wild Europe Boxed Set

Part travel adventure, part nature expedition, *Wild Europe* presents an untamed, unexpected experience that reveals a Europe few have ever seen. This stunningly filmed special unveils hundreds of European species in their natural habitats. Includes *Wild Seas, Wild Mountains, Wild Arctic, Wild Grasslands, Wild Origins* and *Wild Cities*.

6 hrs. on 6 cassettes **WG653 $69.95**

The Wonder of Life Boxed Set

Hidden from the human eye, the wonder of life unfolds in, on and around us with startling beauty and unexpected drama. Includes *The Odyssey of Life Set (The Ultimate Journey, The Unknown World, The Photographer's Secrets)* and *The Miracle of Life*.

4 hrs. on 4 cassettes **WG177 $59.95**

Physical Science

The Best Mind Since Einstein

A profile of the late Richard Feynman—atomic bomb pioneer, Nobel prize-winning physicist, acclaimed teacher and all-around eccentric. *Educational use only.* 1 hr. **WGW708* $19.95**

Daredevils of the Sky

Strap in for a ride with America's greatest stunt pilots. Stunning in-air photography puts you in the pilot's seat with the US Aerobatic Team.

1 hr. **WGW2103 $19.95**

Einstein Revealed

Journey into the life and thoughts of a genius—through interviews with "Einstein" (Andrew Sachs of *Fawlty Towers*), insight from experts, and some whimsical computer animation.

2 hrs. **WG2311* $19.95**

Fast Cars

Follow a racecar driver and engineers as they design a faster car. 1 hr. **WG2208 $19.95**

Faster Than Sound

The race to build an aircraft that could crack the sound barrier was fraught with danger, ambition, and intrigue. *NOVA* tells the real story of those who risked all to make aviation history—including Chuck Yeager, the first pilot to fly faster than sound. 1 hr. **WG2412 $19.95**

Race to Catch a Buckyball

Learn about the chance discovery of an entirely new form of carbon—soccer-ball-shaped miraculous molecules called Buckyballs. *Educational use only.* 1 hr. **WG2216* $19.95**

Roller Coaster!

The thrill of the world's greatest rides and the science that creates them. *Educational use only.* 1 hr. **WGW706* $19.95**

Super Bridge

Take a look at "the bridge of the future" and play sidewalk supervisor on one of the world's most remarkable and risky bridge projects—the building of the elegant, cable-stayed Clark Bridge spanning the Mississippi at Alton, Illinois.

2 hrs. **WG2416 $19.95**

Supersonic Spies

This true tale of Cold War espionage reveals what really happened at the 1973 Paris air show, a supersonic competition between Soviet and French planes, when the Konkordski went down in a fatal, fiery explosion, never fully explained by either the French or Soviets.

1 hr. **WG2503 $19.95**

Time Travel

Join scientists Kip Thorne, Stephen Hawking and others to see a theoretical time machine that may someday make time travel a reality. *Educational use only.* 1 hr. **WG2612* $19.95**

Top Gun Over Moscow

For half a century we feared them. Now, for the first time, meet the rugged pilots of the Russian Air Force—and take a close-up look at the heart-stopping maneuvers that still fill Western flyers with awe. 1 hr. **WG2315 $19.95**

Mathematics

Trillion Dollar Bet

NOVA follows the riches-to-rags story of two Nobel Prize-winning economists whose mathematical formula to accurately predict financial markets brought them both notoriety and disgrace. *Educational use only.*

1 hr. **WG2704 $19.95**

The Proof

Princeton math whiz Andrew Wiles spent eight secluded years perfecting the proof of Fermat's Last Theorem, a famous enigma that had stumped experts for 300 years. Follow a fascinating tale of obsession, secrecy, brilliance—and one man's inspiring single-minded quest. *Educational use only.* 1 hr. **WG2414* $19.95**

NOVA Field Trips

Amazing Animals

From bugs to bats and more. Includes *All-American Bear, Little Creatures Who Run the World* and *Mystery of the Animal Pathfinders*. Teacher's guide included. 3 hrs. on 3 cassettes.

WG089 $49.95

Creatures of the Sea

Dive deep for an underwater visit with the ocean's most fascinating creatures. Includes *Shark Attack!, Private Lives of Dolphins* and *Treasures of the Great Barrier Reef*. Teacher's guide included. 3 hrs. on 3 cassettes.

WG091 $49.95

Discovering Ancient Cultures

Investigate new clues for ancient cultures. Includes *This Old Pyramid* (90 min.), *Vikings in America*, and *Warriors of the Amazon*. Teacher's guide included. *Educational use only.*

3.5 hrs. on 3 cassettes. **WG092 $49.95**

The Doctors

Watch doctors operate behind the scenes. Grades 7 and up. Includes *MD: The Making of a Doctor* (2 hrs.) and *Ebola: The Plague Fighters*. Teacher's guide included.

3 hrs. on 2 cassettes. **WG104 $49.95**

The Earth

A close-up look at some of Earth's most spectacular phenomena. Includes *In the Path of a Killer Volcano, The Day the Earth Shook* and *Flood!*. Teacher's guide included. 3 hrs. on 3 cassettes.

WG110 $49.95

Exploring Space

View the universe from new perspectives. Includes *Countdown to the Invisible Universe, Death of a Star* and *Rescue Mission in Space*. Teacher's guide included. 3 hrs. on 3 cassettes.

WG107 $49.95

Fast Physics

Understand the thrill and power of motion. Includes *Roller Coaster!, Fast Cars* and *Daredevils of the Sky*. Teacher's guide included. *Educational use only.* 3 hrs. on 3 cassettes.

WG086 $49.95

Flight

Feel the exuberance and the thrill of flight. Includes *Top Gun Over Moscow, Three Men and a Balloon* and *Aircraft Carrier!*. Teacher's guide included. 3 hrs. on 3 cassettes. **WG111 $49.95**

The Human Body

The intricate wonders of the human body are revealed in extraordinary visual detail. Includes *The Miracle of Life*, *The Universe Within* and *The Ultimate Journey*. Teacher's guide included. 3 hrs. on 3 cassettes. **WG085 $49.95**

In Search of Human Origins

The development of the human race. Includes *The Story of Lucy*, *Surviving in Africa* and *The Creative Revolution*. Teacher's guide included. 3 hrs. on 3 cassettes. **WG109 $49.95**

The Mysteries of the Mind

Explore the intriguing phenomena of perception, psychological development, and reports of alien abductions. Includes *Kidnapped by UFOs*, *Secret of the Wild Child*, and *Stranger in the Mirror*. Teacher's guide included. *Educational use only*. 3 hrs. on 3 cassettes. **WG105 $49.95**

The Planets, The Stars and More

Visit extraordinary places in the universe. Includes *Venus Unveiled*, *Eclipse of the Century* and *Doomsday Asteroid*. Teacher's guide included. *Educational use only*. 3 hrs. on 3 cassettes. **WG087 $49.95**

Scientific Detectives

Search for answers to intriguing mysteries. Includes *Codebreakers*, *Hunt for the Serial Arsonist* and *In Search of the First Language*. Teacher's guide included. *Educational use only*. 3 hrs. on 3 cassettes. **WG090 $49.95**

Secrets of Lost Empires

Travel to five archaeological sites with *NOVA* and their teams of experts. The mission? To replicate ancient engineering feats—using traditional tools. Includes *Stonehenge*, *Inca*, *Obelisk*, *Colosseum* and *Pyramid*. Teacher's guide included. 5 hrs. on 5 cassettes. **WG304 $69.95**

Wild Weather

Join "stormchasers" on a journey into danger to learn how to tame nature's fury. Includes *Lightning!*, *Tornado!* and *Hurricane!*. Teacher's guide included. 3 hrs. on 3 cassettes. **WG086 $49.95**

Instructional Videos

Fast Cars Modules Set

Understand cars to understand physics. *Invisible Forces of Winds* puts students at the controls of an Indy 500 race car to demonstrate aerodynamics. *To Survive at High Velocity* demonstrates how vectors show how "corners make the driver and the car." *Test Day* lets you understand the complexity of race cars by testing every variable on the track. In *A Racing Engine for the Indy 500*, two companies battle to harness energy to create power. Teacher's guide included. *Educational use only*. 1 hr. on 4 cassettes. **WG2208A $49.95**

NEW! Learning That Works

A unique three-video set and an 80-page comprehensive facilitator's guidebook that demonstrates the benefits of learning science with real world applications. *Learning That Works* presents options for teaching science that integrates what students learn in their science classes with what they do at work or in the community. 2 hrs. on 3 cassettes **WG983 $99.95**

NEW! Physics By Inquiry

Physics By Inquiry: A Video Resource illustrates a hands-on, inquiry-oriented approach to the study of science that can strengthen teacher's understanding of basic physics and physical science and help them begin to teach through inquiry. 90 min. **WG963 $19.95**

Science First Hand Set

Observe teachers and students at work. *Structures* – Designing houses, bridges and towers to explore force, tension and compression. *Tops and Yo-Yos* – Understanding rotational motion by designing and building tops and yo-yos. *Waterwheels* – Simple machines that demonstrate efficiency, speed and testing variables. Teacher's guide included. *Educational use only*. 105 min. on 3 cassettes. **WG005 $39.95**

NEW! Science K-6: Investigating Classrooms

Step inside three elementary classrooms to see what teachers from around the country are doing to incorporate in-depth investigations into their science lessons. This library of nine videos and a 110-page Facilitator's Guide are an invaluable resource in learning and refining the fine craft of teaching by observing and discussing real classrooms. The teachers offer themselves and their students as case studies in an effort to raise questions and inspire discussions about what it takes to prepare scientifically literate students. 7 hrs. on 9 cassettes. **WG545 $199.95**

Ordering Information

Phone

Call 1-800-949-8670 and mention keycode "0200" (8 AM to 3 AM EST 7 days a week). Please have your American Express, Visa, MasterCard or Discover card ready.

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Fax your order with credit card payment or purchase order to: Dept. 0200, 1-802-864-9846

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Mail your order with credit card payment or purchase order to: NOVA Video, Dept. 0200, South Burlington, VT 05407-7284

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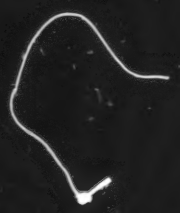

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